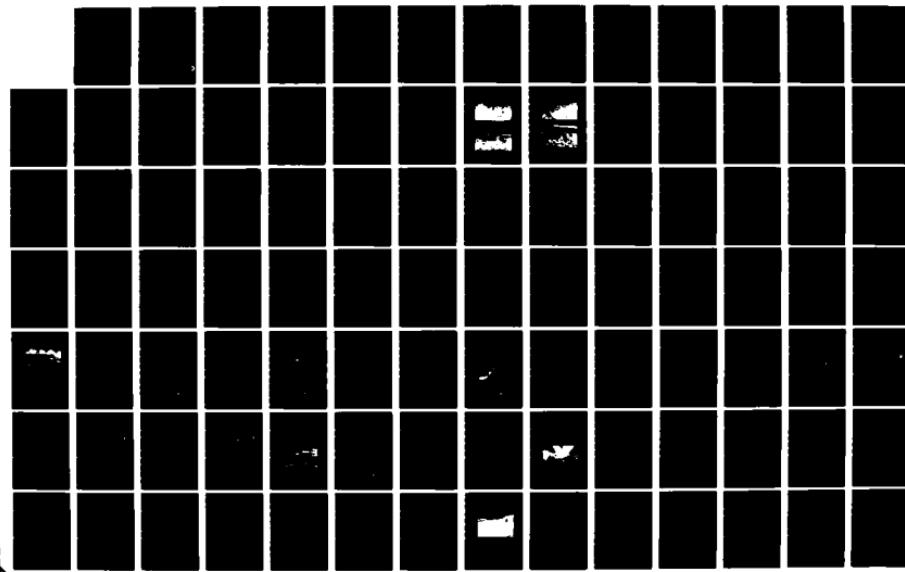
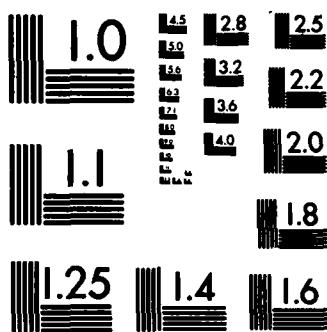


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Intensive Survey of Two Rivers Dam  
and Reservoir Project,  
Chaves County, New Mexico

-FINAL REPORT-

Prepared for the Corps of Engineers,  
Albuquerque District, New Mexico  
(Contract No. DACW47-81-C-0029)

By

David A. Phillips, Jr.  
Philip A. Bandy  
Karen Scholz

New World Research, Inc.  
P.O. Box 40937  
Tucson, Arizona 85717

November 1981

Report of Investigations, No. 60

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## ABSTRACT

In October 1981, New World Research, Inc. carried out an archaeological survey of the Corps-owned lands at Two Rivers Dam and Reservoir, Chaves County, New Mexico, for the Albuquerque District, U.S. Army Corps of Engineers. The survey covered lands in and adjacent to the Hondo and Rocky Arroyo valleys, in grassy foothill country on the west edge of the middle Pecos Valley.

Heavily disturbed areas were not studied, leaving 1900 acres which were intensively surveyed. Thirty-six sites and 57 isolated finds were located. Most sites appear to be loci of lithic procurement and initial reduction sites (chert outcrops occur in this area), ranging from individual chipping stations to sites several hectares in size. Several campsites were also found, including two which appear to be extensive "base camps" for large social units. Based on very limited evidence, occupation of the study area was greatest during the Archaic and early Formative periods.

Although several sites are considered individually eligible for the National Register of Historic Places, the authors argue that the study area should be considered eligible for nomination as a district. The report closes with management recommendations for Two Rivers cultural resources, including suggestions for additional survey and for a monitoring program for potentially endangered sites.

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In the field, the authors were assisted by Robert Buitron, as photographer. In the report preparation that followed, several members of NWR were especially helpful. Jan Campbell and Jay Altschul edited and criticized, Susan Keuer Jones and Robert Corley drafted illustrations, and Gregory Sands de Jean burned up the keyboards to get out our drafts. To these people and to all the others who helped, our deepest appreciation.

DAP  
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## CHAPTER 1 INTRODUCTION

In October 1981, New World Research, Inc. carried out an intensive cultural resources survey of Corps-owned land at Two Rivers Dam and Reservoir, Chaves County, New Mexico, for the Albuquerque District, Corps of Engineers (Figure 1). Surveyed areas excluded the zones already flooded, as well as areas heavily disturbed by dam-related construction, resulting in coverage of about 1900 acres (Figure 2). In the course of the survey, 36 sites and 57 isolated finds were recorded; descriptions and recommendations for these sites are contained in this report.

### Background to the Survey: Two Rivers Dam And Reservoir Project

Two Rivers Dam and Reservoir was completed in 1963, and is maintained by the Corps of Engineers to control flooding on the Hondo River. The project is located in the lower foothills east of the Sacramento, Sierra Blanca, and Capitan Mountains in Chaves County, New Mexico (EIS 1973). There are actually two earthfill structures to control the floodpool, one astride the Rio Hondo and a second across a tributary of the Hondo, Rocky Arroyo. The two structures are necessary because of a broad, low swale which connects the two valleys.

Spillway crest for the dams is 4032 feet; at that height the floodpool would cover 4806 acres (1944 ha). So far, the reservoir has not come close to capacity. Maximum height of areas significantly affected by flooding is about 3970 to 3985 feet. This variation is caused by differences in pool base behind each dam, and by the tendency of water impounded by Diamond A Dam (on the Hondo) to spill into the basin behind Rocky Dam.

### Objectives of the Present Investigation

Objectives of the present work were to:

- 1) Develop and apply a problem-oriented research design appropriate for the project region;
- 2) Locate, identify, and describe all cultural resources which could reasonably be detected from the surface;
- 3) Evaluate all cultural resources for the National Register of Historic Places;
- 4) Identify sources of adverse impact on cultural resources and evaluate their effect on a site-by-site basis; and
- 5) Recommend management strategies for all identified cultural resources.

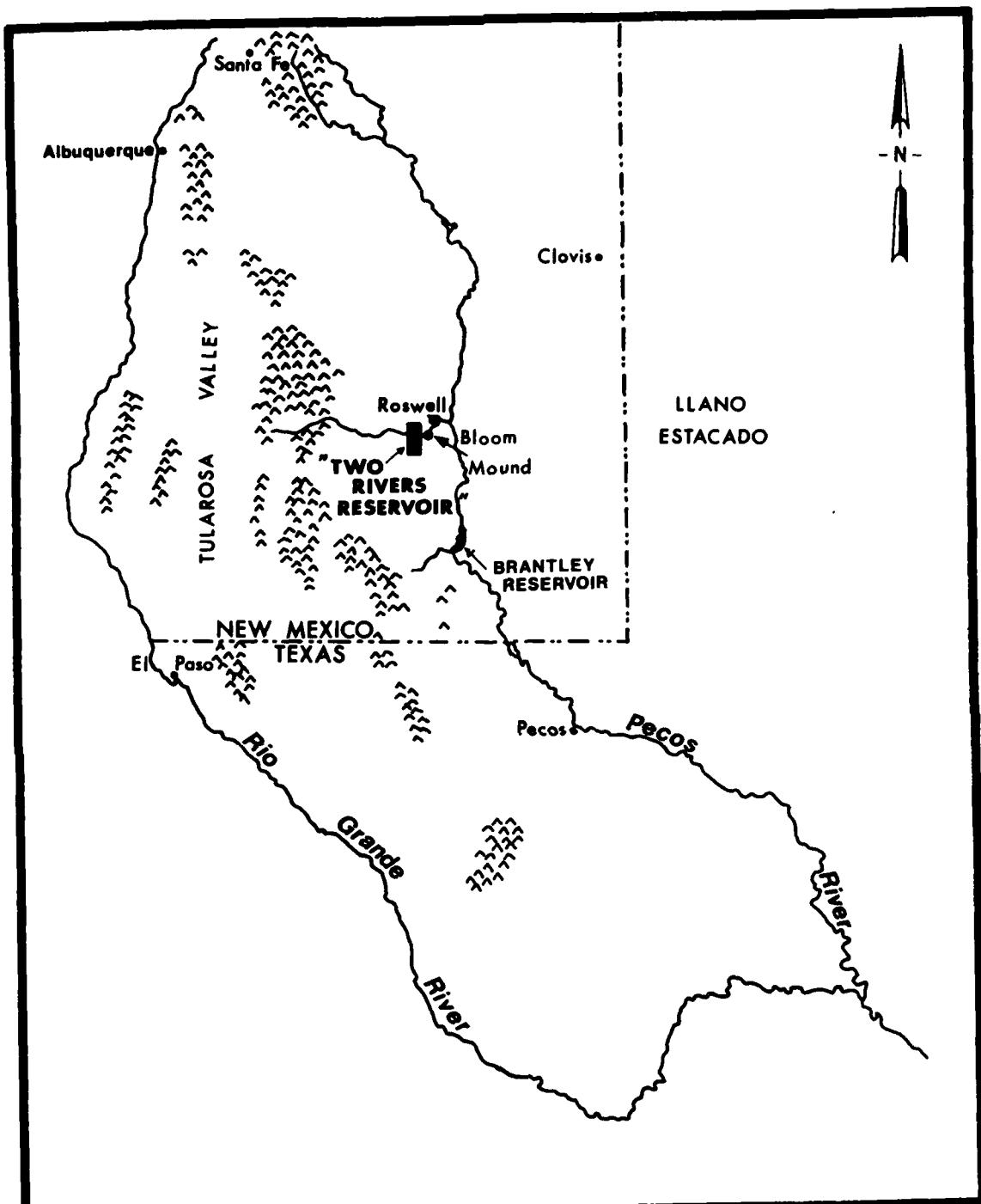
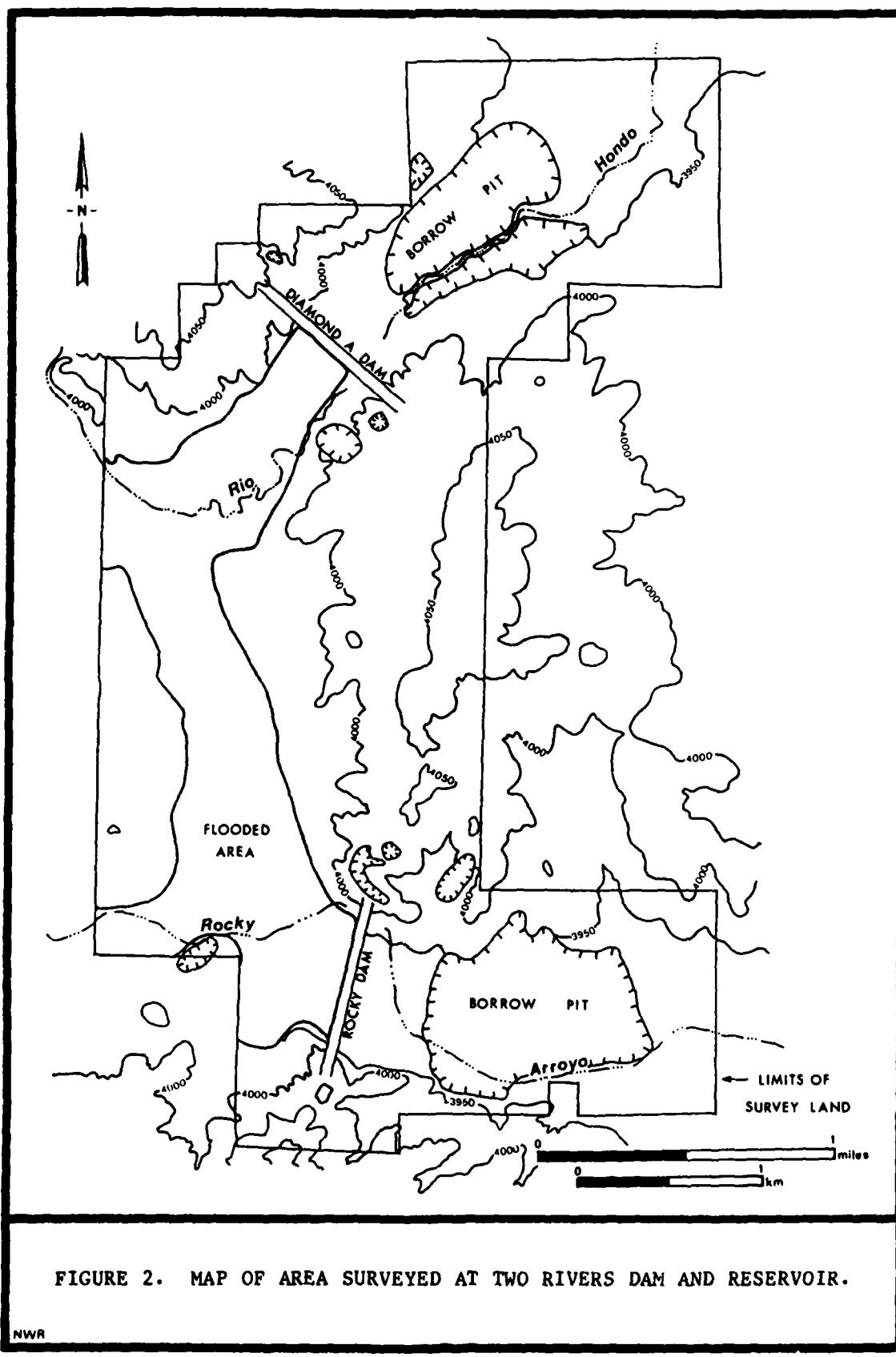


FIGURE 1. LOCATION OF PROJECT AREA IN SOUTHEAST NEW MEXICO.

0 80 miles  
0 100 km

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### Summary of Work Carried Out in the Present Survey

Work carried out during this project was guided by the Corps' RFP and by the research design in the original proposal (NWR 1981). The research issues raised in the proposal were expanded on and modified prior to fieldwork (see Chapter 4) and included information obtained at the Laboratory of Anthropology, Santa Fe, and the Albuquerque District office, Corps of Engineers. Additional information was obtained through published references (including at the Roswell Public Library) and from Chaves County records.

Actual survey was carried out in October 1981. Twelve days were spent in the field, including initial reconnaissance with a half crew on the first day and subsequent work with a crew of four. Total person-days in the field was 46. In all, 36 sites and 57 isolated finds were located. Our methodology is discussed along with the research design in Chapter 4.

The study area includes about 3000 acres of Corps land. Within that area, about 1100 acres were disturbed by dam construction, flooding, borrow pits for dam fill, roads, work areas, and quarry areas. The portion actually surveyed, therefore, includes about 1900 acres, or roughly two-thirds of the Corps-owned land. Upstream from this land is a large area subject to inundation by the dams; the Corps holds easement rights on the land, but most of it is owned privately. None of the flood basin on these easement lands was surveyed. An attempt to survey a sample of these lands met with resistance from the local rancher and was abandoned.

Boundaries of the current study area are well marked with white corner posts, wooden stakes, and steel fenceposts (Figure 1). At times, however, the markers disagreed with maps, land office markers, or previous boundary fences. The most notable example of this was around Bloom Well, which was excluded from the fee lands on a Corps map but which was included according to the boundary markers. While noting the discrepancies in boundary location, we adhered to the marked boundary in all cases but one. This was at the north-south boundary segment between Sections 34 and 35 and 2 and 3; in this instance the Corps boundary differed from both the present fenceline and the section corner marker. Here we did not cross the fence into what would seem to be private land; this shaved a few feet from the marked edge of the study area. These discrepancies may warrant further Corps attention.

One factor which must be considered in judging the survey's effectiveness is the extent to which sites were visible. In hill areas, soil and grass cover was usually thin enough to permit site detection. In side drainages and valley floors, however, grass cover was quite thick, tending to mask smaller finds. Moreover, it appears that much of the Hondo Valley flood has been covered with silt since the main aboriginal occupation of the area. As we discuss later in the

report, sites on the valley flood may be much more extensive than surface survey revealed.

Data analysis and report preparation began immediately after the end of fieldwork. Work in this stage included preparation of formal records on sites and isolated finds. Site forms and other records related to this project are on file at the Laboratory of Anthropology (Museum of New Mexico, Santa Fe) and at the Albuquerque District, Corps of Engineers.

## CHAPTER 2

### SETTING

Much of this chapter is based on an environmental study of the project area (EIS 1973), and on field observations. Additional sources are noted where appropriate.

#### Physiography

The Two Rivers Reservoir is located in limestone foothill country on the west edge of the Pecos River valley (Figure 1). The local hills are carved from Permian limestones and dolomites of the San Andres formation. The Rio Hondo drains parts of the mountains to the west, but Rocky Arroyo has its source in the foothills themselves. A broad, low swale connects the two valleys just above the dams. Both rivers are intermittent and neither was flowing during our survey.

The hills in the study area have gently rolling but rocky slopes. Bedrock outcrops are common. Upper slopes are characterized by Ector soils, with an angular limestone content of 35 to 75 percent. In these areas, soil depth rarely exceeds 5 cm. In drainages and on lower slopes, however, thicker Conger soils are present. These are calcareous, gravelly surface loams underlain by caliche or cemented soils. Angular pieces of caliche are present. The Conger soils in the area are clearly derived from erosion of upper-slope areas with much of this erosion possibly occurring in the past few hundred years.

The limestones in the study area contain several varieties of chert, mostly in the form of small nodules. Because soil cover is so thin, natural angular fragments of chert can be seen on the surfaces of many hills in the study area. As will be discussed later, such outcrops of workable stone were used extensively by native groups.

A few stream cobbles of nonlocal stone are also found peppered over the lower slopes of the hills. Some of these may be manuports, but many may be relict items from a period (probably middle Pleistocene or earlier) when the local valleys were not as deeply cut as they are today. These materials were also used for chipped stone.

The Rio Hondo and Rocky Arroyo are both characterized by fairly narrow but gently sloping floodplains. In the Hondo, Elfrida soils are present. These include a thin layer of grayish-brown silty loam over substantial deposits of silty clay loam, and are strongly calcareous. In the Rocky Arroyo floodplain, Pima soils occur. In these, dark calcareous clay loams overlie coarser strata which include some gravels. In both the Hondo and Rocky drainages, floodplain alluvium commonly includes a substantial basal layer of cobbles, which include igneous and metamorphic materials derived from upstream areas. (These deposits, when exposed, may have been a third source of work-

able stone, as well as of manos.) In some places the cobble layer is absent, in which case the floodplain sediments rest on limestone bedrock.

The Middle Pecos valley is characterized by a series of alluvial terraces representing cycles of erosion and deposition. We had difficulty finding evidence of these processes in the study area, because of the limited study area size and extensive mechanical disturbance related to dam building. It does appear, however, that alluvial terraces are present along Rocky Arroyo. In contrast, the portion of the Hondo in the project area seems to lack terracing. Instead, the drainage system underwent successive stages of alluvial buildup. These alluvial events are discussed further in Chapter 7.

#### Climate, Vegetation, and Fauna: A Historical Perspective

In eastern New Mexico even subtle environmental shifts probably had marked effects on human populations. Unfortunately, these changes are not fully understood. Research in the last two decades, however, has provided at least a sketch of the major changes and will be summarized below.

Demonstrated human occupation of the Southwest began at the end of the Pleistocene. Regional climate at that time was much cooler and wetter than today, and the survey area probably supported rich grasslands and forests. Fauna such as musk-ox, horse, mammoth, and bison were found in the general region. Cobble strata in the Hondo and Rocky Arroyo suggest a strong and probably perennial flow of water in these streams. With the close of the Pleistocene (about 9,000 B.C.), a shift to modern climate and life forms began.

It would appear that the period from 9,000 to about 5500 B.C. was still quite cooler and wetter than today. Evidence for this claim comes from alluvial deposits (Antevs 1955; Haynes 1968), from pollen (Mehringer 1967), and from packrat midden analyses (King 1976; King and Van Devender 1976; Van Devender 1977; Betancourt and Van Devender 1981). Stands of spruce and pine survived in some parts of the New Mexico plains (Irwin-Williams 1979:31), and forests elsewhere extended as low as 2000 feet. Although a general warming and drying tendency is suggested, some Pleistocene fauna continued to survive into this period.

According to the Bryan-Antevs model (Antevs 1955), the period from 5500 to 2000 B.C.--the Altithermal--was much warmer and dryer than today based on pollen evidence. Martin (1963) disputed the existence of such an extreme period, but the weight of evidence still favors Antevs' position (see Irwin-Williams 1979:32). The start of this period witnessed the eastward retreat of Plains-type grasslands (which had once extended into Arizona) and the upward retreat of conifer forests. Packrat midden data indicate that vegetation from 5500 B.C. onwards was not grossly different than that today. In other words,

environmental effects on human groups during the Altithermal were probably more in terms of fluctuations in biotic productivity rather than wholesale shifts in the natural setting.

The period from 2000 B.C. to the present is termed the Medithermal and the climate was much like that today. As in recent times, episodes of drought and arroyo cutting are known to have occurred, and in some cases seem to be associated with population shifts or other cultural changes (see Euler and others 1979). The timing of the various erosion episodes--probably caused by intense summer rains--is not quite agreed on. For example, Irwin-Williams (1979: based on Haynes 1968 and Irwin-Williams and Haynes 1970) places a brief erosional cycle at about A.D. 500-700, whereas Euler and others (1979) place what is probably the same episode in the ninth century A.D. While these differences need to be resolved, it is clear that Southwestern climate is variable; any successful adaptation had to be flexible enough to deal with fluctuations, whether short-term changes in rainfall (Dean and Robinson 1977) or longer-term climatic shifts leading to cycles of erosion and deposition.

In the nineteenth century, a new period of intense summer rains began, and with it a new episode of erosion and arroyo cutting. The process continues today, and has been accelerated by grazing, fire suppression, and groundwater pumping (Hastings and Turner 1965; Dobyns 1981; Bowden 1977). Before dam construction, the most visible effect of these changes was conversion of the Hondo from a live to an intermittent stream (see Chapter 6).

#### Present Flora and Fauna

At present, biotic variability within the study area is probably not very significant in terms of human adaptation. Indeed, in later chapters we will treat biological factors as a constant. Except along the Hondo and Rocky Arroyo, the entire area is characterized by a Grama-Galleta Steppe community (Plates 1-4) (Kuchler 1964). A number of other grasses (such as beardgrass, three-awn, panic-grass, and dropseed) are also present. Both the quality and amount of grass cover is impressive--this is outstanding rangeland. Mesquite is found widely scattered over the area, with concentrations in side drainages and on lower hillslopes (but may be a fairly recent introduction--see Jelinek 1967:138-139). Snakeweed is common. Other, occasional plants include cholla, prickly pear, yucca, devil's claw, wild gourds, and saltbush. In the southern part of the study area, a few small clusters of creosotebush are present. The overall impression one gets is of "grass and more grass."

Along the Hondo and Rocky drainages, there are thin lines of trees (Plate 2). Hackberry, mountain willow, and mountain walnut are present, as has been the case for at least 100 years (EIS 1973).



PLATE 1. GENERAL ENVIRONMENT. (View from IF-13 across Hondo valley.)



PLATE 2. GENERAL ENVIRONMENT: HONDO FLOODPLAIN. (Note line of trees along channel. Preparation of a transect [at LA 33104, Locus 2] is foreground.)



PLATE 3. ENVIRONMENT: HILLS NORTH OF HONDO.



PLATE 4. ENVIRONMENT: SWALE BETWEEN HONDO AND ROCKY ARROYO.  
(Note darker vegetation [due to flooding] in swale.  
LA 33109 in foreground; Diamond A Dam in right  
background.)

In disturbed areas, vegetation changes are marked (Plate 3). Snakeweed and other composites dominate these areas. Within previously flooded areas, some stands of tamarisk occur. (This species was present before dam building occurred [EIS 1973] but has been encouraged by flooding.) Sacaton is especially common along the Hondo just upstream from the Diamond A Dam. Disturbance vegetation was thick even in flooded areas not heavily silted over.

The present plant community does not really offer a great deal to the hungry. In contrast, the animal life is impressively rich. The environmental study (EIS 1973) lists 30 species of birds and 15 species of mammals, the latter including jackrabbits, cottontails, small rodents, badgers, mule deer, and antelopes. Large and small game species were commonly seen during survey, but this may be due in part to many years of predator eradication programs.

## CHAPTER 3

### REVIEW OF PREVIOUS ARCHEOLOGICAL WORK AND CULTURAL SEQUENCE

#### Previous Archaeological Work

The first sustained archaeological research in the Two Rivers area was carried out in 1958 (Schaafsma, Mayer, and Wilson 1967). During the work, two sites were found within the potential floodpool of the Two Rivers Reservoir, but outside the present study area. One, LA 6992, is the Plaza de San Jose (Missouri Plaza), which was subsequently tested by the Museum of New Mexico (Schaafsma, Mayer, and Wilson 1967). The other site, LA 6993, was a sherd, lithic, and burned rock scatter which was surface collected at the same time.

San Jose was later revisited during an environmental study (EIS 1973). According to the report, the original testing program failed to locate most of the house remains at the site. The same report notes the discovery of a tepee ring, which was recorded by this project as part of a more extensive site.

Other work near the study area provides useful comparative material. The Laboratory of Anthropology site records include several Mogollon V sites on the Hondo just downstream from the study area (see also Wolfe 1931). One of these, Bloom Mound, is discussed in a dissertation by Kelley (1966). In the same work, Kelley provides the first real synthesis of Sierra Blanca--Western Middle Pecos archaeology, and defines several phases of local occupation.

North of the study area, the widening of U.S. 70 has led to several right-of-way surveys between 1970 and 1980 (Camilli 1980) during which a number of prehistoric and historic finds were made. Most recently, John Speth (1981 personal communication) has worked in the Hondo area; his excavations include a Hondo valley pueblo and a ceramic-period bison kill.

Several other studies, though less directly related to the present one, can be noted. The best known early worker in the region was A.V. Kidder, whose pioneering work at Pecos Pueblo led to the definition of the Anasazi cultural sequence (Kidder 1924). Much later, Jelinek (1967) combined archaeological, historical, geological, and palynological evidence to establish a cultural sequence in the middle Pecos Valley. The same area was dealt with in a more processual vein in Henderson's (1976) study of Brantley Reservoir on the Pecos. These reports, combined with others from adjacent portions of the Southwest,

provide an adequate basis for a general reconstruction of the study area's culture history.

### Culture History

#### Prehistoric and Protohistoric Periods

Paleo-Indian presence in eastern New Mexico (see Figure 3) is marked by the utilization of caves and rockshelters in addition to "kill-butchered" open sites. Perhaps the most systematically excavated Paleo-Indian site is Burnet Cave, west of the study region in the Guadalupe mountains. Excavated by Howard (1935), the site yielded a "Folsom" type point and several examples of now extinct Pleistocene fauna, including horse and musk-ox. Burns (1967) obtained a radiocarbon date of  $7432 \pm 300$  B.P. on material from the cave, but the relationship of the sample to the Folsom and extinct fauna levels is uncertain. Other cave sites have also been tested (Ferdon 1946; Ayer 1936; see Judge 1973), allowing the reconstruction of probable Paleo-Indian subsistence schemes. At least in the Guadalupe Mountain area of New Mexico, dependence on such Pleistocene fauna as musk-ox and horse (plus occasional bison) is suggested. As mentioned in the previous chapter, the climate at that time was cooler and wetter than today; plains-like grasslands may have covered many parts of the Southwest.

The advent of the Altithermal gradually brought about significant changes in both climate and vegetation in eastern New Mexico. Sites such as Rattlesnake Draw and Milnesand (Simith, East-Smith and Runyan 1966; Sellard 1955) are representative of the final gasp of the Paleo-Indian big game hunting tradition. Many large fauna were extinct by this point; the plains grasslands had receded, and a more generalized subsistence pattern based on a wide range of plants and animals had developed. This Archaic pattern is probably the least well-defined of any occupation in the region. Although Archaic sites have been excavated in the Guadalupe, similar data are lacking for sites in the Pecos Valley proper. Jelinek (1967), Collins (1968), and Henderson (1976) all report Archaic materials from open lithic scatters in the valley. Slightly to the east, at Blackwater Draw, survey work on the Archaic occupation (Kunz, Gamache, and Agogino 1973) has also been conducted.

In a broad sense, Archaic remains of the area can be linked to the Desert Culture tradition defined by Jennings (1964). However, Jennings' concept is losing its heuristic value; often, it is used as an excuse to gloss over the Archaic as a period of near-static adaptation by small social units. Perhaps this was true for parts of the Great Basin, but recent work in the Southwest proper has not tended to bear it out. Irwin-Williams (1967, 1973, 1979), in particular, has argued for a dynamic interpretation of the Archaic; her own work indicates a trend towards larger and more substantial sites, suggesting spatially more restricted and increasingly intensive resource use through time.

TENTATIVE CHRONOLOGY---TWO RIVERS AREA

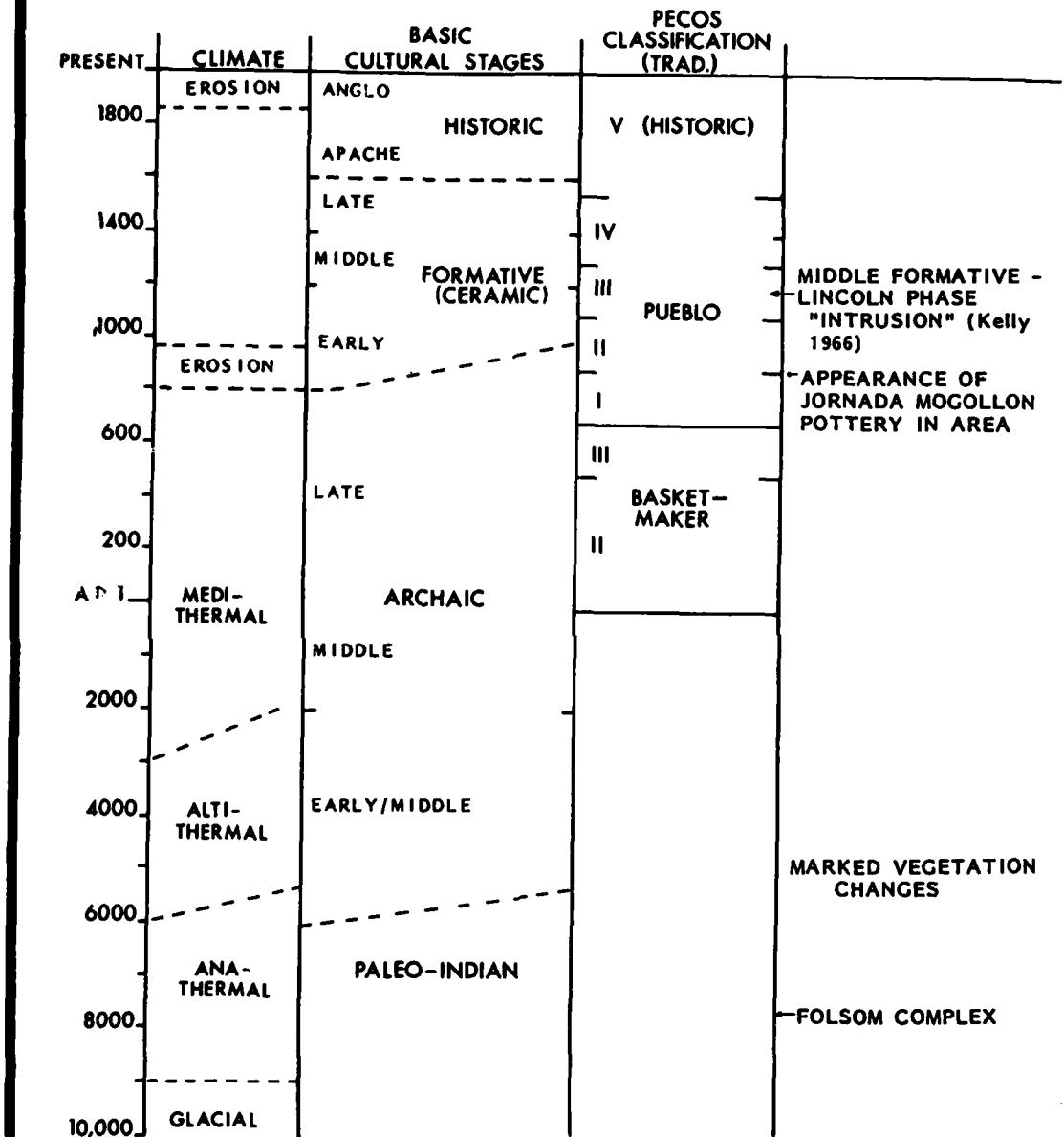


FIGURE 3. TENTATIVE CHRONOLOGY OF THE TWO RIVERS AREA.

In southeastern New Mexico, Archaic occupation may have been minimal until the end of the Altithermal. Irwin-Williams (1979:41-42) believes that at about this time, an Archaic tradition spread into the southern part of the state from the Chihuahua area. Jelinek (1967:143) advanced a slightly different view, seeing few differences between Middle Pecos Archaic remains and those from surrounding areas.

Although our data are limited, it appears that unlike the classic centers of the Southwest, the Pecos Valley maintained an Archaic occupation long past the initial appearance of Basketmaker culture to the northwest, the Vahki phase to the extreme west, and Forestdale phase Mogollon to the southwest. It is not until nearly a thousand years after the appearance of pottery in these regions that ceramic-bearing cultures appear in the middle Pecos. The retention of an Archaic pattern in the region to the exclusion of more sedentary cultural manifestations is still not understood. Perhaps eastern New Mexico was more profoundly affected by Altithermal xeric-mesic cycles than other parts of the Southwest. These fluctuations could have hindered the successful introduction of horticulture into the region. The Archaic patterns do seem to be fairly stable, showing a marked dependence on exploitation of deer, small mammals, and plant foods (Henderson 1976; Shafer and Bryant 1979), with periodical use of bison (Dibble 1968; Mera 1938).

The persistence of Archaic patterns is not confined to eastern New Mexico. Similar patterns of foraging exclusive of formal structures or ceramics are present in the Llano Estacado to the east through the Texas panhandle (New World Research 1981b), and into the lower Pecos Drainage (Shafer and Bryant 1979). It is interesting, then, that Jelinek (1967:143) sees some similarity between Middle Pecos and West Texas Late Archaic remains. This pattern stands in marked contrast to that to the west and south, near El Paso (Whalen 1977, 1978); there, pithouses villages with pottery develop from a Late Archaic occupation in the first few centuries A.D.

Although by A.D. 900 pottery-making cultures are known to be in the Middle Pecos region (Henderson 1976), evidence of occupations are still spotty and ill-defined. As noted earlier, Kidder established an Anasazi presence well to the north of the study area, in the hill country of the Sangre de Cristos. While Jelinek (1967) reports the presence of Pueblo II-III artifact types, and occasional earlier types, in the Fort Sumner area (north of the study area), it does not appear that Puebloan people moved into the region until middle Pueblo III and Pueblo IV times.

One of the more definitive Puebloan manifestations is Bloom Mound. This Jornada Mogollon site is a small and heavily vandalized pueblo on the Hondo (Kelley 1966). Both the assemblage from the mound and the architectural style is virtually identical to ones within the Tularosa Basin, 100 miles to the west. Bloom Mound has long been thought of as an anomaly: no other such site was known to be so far to the east of the Sierra Blanca--Tularosa region. One hypothesis was that Bloom

Mound was an outpost for trade with the Plains (Burns 1967). However, Speth's (1981 personal communication) work indicates that several small pueblos were coeval with Bloom Mound in the Hondo Valley just downstream from the study area. Recent evidence, therefore, suggests a small agricultural colony rather than a lone outpost.

Elsewhere in the Middle Pecos, ceramic sites are marked by the presence of shallow pithouses, occasional roofed structures, and ring middens with associated burned rock mounds. This pattern is of special interest, because it suggests that Archaic patterns were carried on into the ceramic period. Functional data concerning burned rock mounds indicate their possible use as earth ovens, which are associated with the rendering of fibrous plant foods (Shafer and Bryant 1979; O'Laughlin 1979, 1980). These types of features are prevalent throughout the Archaic period, especially to the south along the lower Pecos and Rio Grande where they were utilized for the processing of lechuguilla and sotol. Furthermore, reliance on deer, small mammals, and processed plant foods tended to be to the exclusion of horticultural products (cf. Jelinek 1967). Curcurbits are present at some sites, but maize appears to be restricted to larger sites, such as Bloom Mound (Burns 1967).

It seems then that the presence of the Anasazi or Jornada Mogollon in the Middle Pecos is limited, and that the orientation of those two cultural units with regards to subsistence departs from their usual horticultural bias. By late prehistoric times (about A.D. 1350 onwards), a local adaptive swing towards bison and other Plains resources is evident (Jelinek 1967; Collins 1968; Speth and Parry 1981). Whether or not this shift is related to an environmental change (as Jelinek suggests), it does indicate the difference between local adaptive patterns and those in the Pueblo heartland. It appears that this adaptive strategy was ended by a population shift occurring just before European contact, with Apachean peoples replacing the earlier inhabitants.

#### Historic and Recent Period

The first Spanish record of Indians in what was later Mescalero country was made in 1541. For the next two centuries, the records allow a vague picture of native life to emerge (Schroeder 1973). The people in question were almost certainly early Apache, but attempts to tract specific bands backwards through time have not been very convincing.

The early Apache in this region were nomadic foragers who alternated between mountains and plains resources. Trading with the more sedentary Pueblos also became part of their adaptive strategy. The material culture included small, skin-covered tepees. By about 1640, these groups had begun to develop a predatory relationship with more sedentary cultures. While the fighting discouraged European settlement of the area, it encouraged some Spanish military intervention in the region. The fighting, which is related to a greater history of Spanish-French-Indian conflict (John 1975), also contributed to the ethnic fluidity of the area.

In the 1800s, the Mescalero per se became a recognizable entity. Like their predecessors, they combined seasonal foraging with trading and raiding. Key plant foods included mescal, datil, pinyon, and mesquite; key animal foods included deer, bison, antelope, and rabbits (Basehart 1973; Basehart 1960, in Henderson 1976; Castetter and Opler 1936). Some foods (especially mescal) could be obtained year-round; others were seasonal, with peak collection activity taking place in the fall. To some degree, seasonal surpluses were stored for latter consumption (Henderson 1976:34-35). Population density was probably somewhere around one person per 125 sq. km (Henderson 1976:30).

In 1846, the U.S. seized control of New Mexico. Thereafter, official policy was aimed at restricting the Mescalero to small areas, thereby opening the remaining land to Euro-American settlers. The Mescalero resisted strongly, but unsuccessfully. The capture of Geronimo in 1886 marked the end of native resistance, but for the Mescalero the fight had become a lost cause two decades earlier (Jenkins and Schroeder 1974:51-55).

It now appears that small numbers of Hispanic American colonists from the Rio Grande Valley moved into the area east of that river in the middle 1800s, before the Mescalero and Comanche were fully subdued (Sheridan 1975; Keleher 1973:184-185). An 1866-1867 survey of the Hondo Valley mentioned cultivated and irrigated land (Shinkle 1964:9). One Hispanic settlement, Plaza de San Jose, lies at the edge of the Two Rivers reservoir pool, just west of the study area. Also known as Missouri Plaza, the site was occupied for a few years before 1867. The inhabitants ran freight wagons to Missouri, grew irrigated crops, and grazed cattle in the area (Shinkle 1964:10). Roswell folklore credits the settlement to Missouri freighters, but Shinkle (1964:277) notes an article in the May 20, 1901 Roswell Register. In that article, J. Francisco Chaves (the county's namesake) remembered a visit to San Jose in 1867. The article states:

Instead of being Missourians as has always been supposed by the uninformed, the inhabitants of the settlement (some thirty to forty families) were Mexicans who had come from Manzano, Valencia County. Most of the men being freighters to Kansas City and St. Joseph [they] decided to call the settlement "La Plaza de Missouri," in order to give it distinction (cited in Shinkle 1964:277).

The settlement was abandoned at the time Anglos reached the area. Reason for abandonment is unknown, but conflicts with the Mescalero were probably decisive.

After the Civil War, Anglo cattle ranching quickly became the dominant regional industry (Jenkins and Schroeder 1974). Starting in 1866, herds of Texas cattle were driven to the Southwest to be sold at Army posts and Indian reservations. The lower Hondo valley was recognized as outstanding rangeland, and was used as a resting-place for cattle; from there some herds were driven up the Pecos River and others up the

Hondo. From about 1870 on, use of the rangeland shifted from temporary pasturage to actual breeding and raising of livestock. Sheep as well as cattle were run in this area, which was still open range. The lack of clear ownership of land and water, the competition between growing herds, and the general absence of civil authority culminated in open fighting. Though dignified as "the Lincoln County War", this was little more than anarchaic feuding and murder. Order was finally restored by Federal intervention.

In the 1880s, the cattle industry underwent fundamental changes. Native groups were finally suppressed, open range was subdivided into ranches and fencelines gradually put in. The first homesteaders in the Roswell area arrived in 1877 and farming quickly became a prominent local activity. The Chisums of the open range were replaced by absentee capital from the East and Britain (Shinkle 1964). The frontier, in effect, had already passed on, for all the evocations of it in later years.

According to Chaves County records, land in the study area took legal form in the 1880s and 1890s. Interestingly, a few Hispanic names appear in the records at this point, but not later. The land has changed hands a number of times, with such prominent names as Anderson, Diamond A, and Bloom (the circle diamond mark) being present. Although the land is now owned by the Corps for flood control, it is still used by two ranches for grazing cattle, a modest echo of days when cowboys rode an unfenced sea of grass.

## CHAPTER 4

### RESEARCH DESIGN AND METHODOLOGY

This chapter describes the research design developed for use during the survey. The "General Issues" section is adapted from the preliminary research design in our proposal (NWR 1981a). Subsequently, existing statements on adaptive patterns in the area are reviewed and general predictions on site type and location are formalized.

#### General Issues

The success of the Two Rivers Dam and Reservoir project depends largely on integrating results into a regional context. The project area itself is relatively small, lying entirely in the Rio Hondo drainage. Yet, the surrounding region encompasses a series of highly diversified environmental zones that range from high mountains to alluvial floodplains. Despite the diversity of resources, the region never supported a large or concentrated population. Occupation was always sparse and dependent on the inhabitants' ability to utilize a wide range of dispersed resources.

To evaluate the survey's results, we must be able to identify the various resources and environmental zones used by the prehistoric inhabitants and then place the middle Pecos River drainage within a range of possible subsistence strategies. To a certain extent, the ethnohistoric patterns of indigenous groups, such as the Mescalero Apache, are useful (see Henderson 1976; Basehart 1960; 1971). The Mescalero were divided into bands whose subsistence was focussed more on deer, small game, and plant gathering than on bison hunting. Henderson (1976) has shown that in their subsistence practices, the Mescalero travelled widely throughout many ecological zones. Even so, an uncritical use of ethnographic analogy is highly misleading. The Mescalero were a tribe in transition. Rather than practicing a stable subsistence pattern, the historical record shows the Mescalero undergoing revolutionary changes, transforming them from small bands of hunters and gathers to belligerent groups of nomadic raiders based on a horse-and-gun technology. Models drawing on the Mescalero, then, may help interpret ethnographic remains or the defensive posture of early Spanish settlements, but can only be of heuristic value for understanding most of the archaeological record.

Yet even if we knew the subsistence/settlement pattern of aboriginal groups prior to Spanish contact, it is questionable how far into the past these practices can be projected. As outlined in Chapter 2, the area has undergone environmental oscillations that seem to be correlated with changes in prehistoric use and occupation. Population

expansion seems to have occurred during the cool and moist periods (Paleo-Indian and Late Archaic) while restricted use or virtual abandonment appears to characterize drier and warmer times (Early and Middle Archaic).

To understand prehistoric and historic settlement and subsistence in the Middle Pecos, we need to develop testable models that take into account both environmental fluctuation and culture change. Traditionally, this endeavor has been hampered by an apparent lack of site diversity. The vast majority of known prehistoric sites are either lithic scatters, lithic and ceramic scatters, or burned rock middens. (This, of course, is not true of ethnohistoric or historic sites, such as tepee rings or Spanish settlements, that can easily be identified.) These types of sites were used throughout the Archaic and Ceramic periods. While many investigators use presence or absence of pottery to distinguish Archaic from Ceramic period sites, it is generally acknowledged that many of the lithic scatters represent short-term camps where the use of ceramic objects would not necessarily be expected.

The inability to establish a more refined chronology has led several investigators to analyze all sites of a given type together. The underlying assumption of these analyses is that functionally these sites represent the same settlement type in a subsistence strategy that was essentially unchanged for thousands of years. Given the environmental data, this assumption is clearly based on very tenuous grounds. Not surprisingly, most results of these analyses have been inconclusive (e.g., Henderson 1976).

Instead of assuming that our present inability to distinguish site types is indicative of tremendous cultural stability, we need to re-examine the basis of our site classes. Previous investigators have used site classes, such as "large lithic scatter/small lithic scatter", as descriptive vehicles to simplify summarizing survey results (see Henderson 1976; Hester 1977). There is nothing wrong with this approach as long as it is clear that the descriptive categories have no necessary functional correlates. Problems arise, however, when investigators try to correlate their descriptive categories with variables believed to have influenced occupation, such as topographic landforms, distance from water, or cultural affiliation. Without specific ideas about how these categories relate to one another, statistical searches produce, at best, inconclusive results and, at worst, spurious and misleading ones.

To produce functionally meaningful site categories that can be used to test models of culture change and stability, we need to address the problems outlined above. Basically, these problems can be broken down between two major issues: adaptive/settlement strategies, and chronological and cultural affiliations.

### Existing Data

The first step in constructing models of adaptive/settlement strategies is to review existing knowledge on settlement patterns in the region. Whereas the Culture History section in the previous chapter provided general background for the survey, this section assembles some of the specific observations on site location made by earlier workers. These observations will subsequently be worked into some tentative predictions of site location in the Two Rivers area.

Kelley's (1966) synthesis of the Sierra Blanca region includes a fairly detailed discussion of the Lincoln phase, which extends into the lower Hondo valley. The phase dates from middle Pueblo III to Pueblo IV times. Most sites are found in pinyon-juniper country (between 5400 to 6200 feet), but Bloom Mound (and, as we know today, other pueblos) are at a lower elevation. Kelley (1966:69) lists three settings in which Lincoln phase sites are common: broad flat areas away from major streams, main valley bottoms, and ridges or terraces set well back from streams. All three location types are clearly related to horticulture. In addition, Kelley notes two more specialized site types (but does not elaborate on their location--1966:69-73): defensive lookout and chert quarries.

Jelinek (1967) does not dwell on specifics of site location in his study of the Middle Pecos Valley, except to correlate sites and alluvial terraces. Most of his survey was on the floodplain and terraces of the Pecos, so his work is at least indicative of the sorts of site associated with that particular setting. These include small to large sherd and/or lithic scatters and sites with permanent architecture. Jelinek does provide some passing comments on site location. He notes that Archaic workshops are found along the top edge of the Mescalero Pediment; "Dunahoo complex" sites occur along stream drainages. Most late Archaic remains are located near good farmland, but Early 18 Mile phase remains include "...relatively permanent settlements in topographic situations suitable for the practice of maize agriculture" (1967:142). These would date roughly to A.D. 900 - 1100.

Henderson's (1976) study of Brantley Reservoir is similarly restricted to the environs of the Pecos River. There, he defined four "functional models" of prehistoric sites. "Artifact and Burned Rock Scatters (Large)" contain large numbers of burned rock and ground stone but relatively few chipped stone artifacts. "Artifact and Burned Rock Scatters (Small)" contain burned rock, ground stone, and retouched chipped stone tools suggesting animal product preparation; Henderson infers that such sites were used by smaller groups carrying out more generalized tasks than at the large sites of this general sort. "Artifact Scatters (Large)" contain chipped stone and pottery but not ground stone; sites of this kind were found clustered on bluffs which commanded the area. They were originally seen as hunting-related but appear to have served several functions. "Artifact Scatters (Small)" seems to be something of a catchall term; chipped stone, ground stone, and pottery were found and function seems to be variable. Henderson divides historic (Anglo) remains less ambiguously into Hamlets, Wellhouses, Homesteads, Dugouts, and Cemetaries (see Henderson 1976:48, Figure 10).

Henderson also postulates changes in adaptation, settlement function, and social organization on the Middle Pecos, as one broad tradition replaces another (1976:40). Unfortunately, these changes are not further addressed because of the limits of his data.

Perhaps the most coherent discussion of settlement patterns for the region is that in Hester (1977). Jornada Mogollon habitation sites include pithouse villages, surface pueblos, and a few rock shelter sites. Pithouse villages occur along the Rio Grande, along mountain stream terraces, and on alluvial fans in basins. Surface pueblos frequently occur in association with extinct playas on basin floors, and on the edges of basins close to the foot of mountains. Rock art sites occur in canyons or on rock outcrops, usually near to (but not directly associated with) occupation sites. Temporary campsites,

...I.e., burned rock scatters with ceramics, are widespread and are known to occur along river valleys, on basin floors, on alluvial fans, and on tops of mountains. In other words, temporary campsites occur in practically all areas (Hester 1977:25-26).

Isolated chert scatters are also found in "a variety of locations." Finally, isolated caches in vessels are found. The same monograph also cites a report in 1849 on the Mescalero, which notes that winter "towns" were located on the banks of the Rio Grande, while spring and summer "retreats" were found in the mountains (Hester 1977:25-27).

Three formal models are also proposed (Hester 1977:113-117). The "Uniformity Model"--that sites are evenly distributed over a landscape--seems to be a straw man. The "Optimal Utilization Model" derived from Central Place Theory, argues that "base camps" will be distributed evenly over the landscape; around each of these will be smaller "exploitation camps", themselves spaced evenly around the base camp. The ratio of small to large camps is set at 6:1. Survey data indicate that non ceramic (Archaic?) sites fit the "Optimal Utilization Model" well, but that ceramic sites do not. One may infer that in this area, ceramic period peoples were not organized in terms of base camps and peripheral camps.

Finally, the report offers a useful inductive generalization (Hester 1977:126). A distinction is made between "watercourse" (or lowland) and "upland" areas. The former are characterized by sites on top of topographic features, and by higher proportions of chipped stone and pottery. Sites in the latter area tend to have less chipped stone and pottery, and to be on the sides of topographic features.

Finally, an anonymous map on file at the Albuquerque District, Corps of Engineers, provides estimates of site densities for the Macho-Roswell Soil and Water Conservation District. According to this map, site densities are greater than six per square mile along the Hondo, and are estimated to be as dense along Rocky Arroyo. Sites are

similarly estimated to be much denser along other major streams or draws than in areas more than a mile or so from these streams.

From the review just made, it is clear that workers in the area have sometimes noted similar tendencies in site function or location, but that so far no general model of site location--relative to function or cultural affiliation--has been developed for southeastern New Mexico.

#### Predictions: Site Types and Settlement Patterns

What follows is an attempt to define a predictive model of site location, relative to site function and general adaptation. While designed for the Two Rivers project, it is also intended to apply to surrounding portions of the Rio Hondo River drainage. The model must be considered highly tentative, and as it stands, of fairly low predictive power. However, it will integrate some of the findings just reviewed, and serve as a "first approximation" which future researchers can expand on, modify, or reject. Four sets of "variables" will be considered: general adaptive strategies, functional variation in sites, activity siting (regional), and activity siting (local).

I. General Adaptive Strategy. Here, four basic life-ways will be distinguished, based on how humans arrange themselves relative to the landscape. These do not represent all possible lifeways for the Southwest, rather those which, based on the literature reviewed, are likely to occur in the area in and around Two Rivers. They are:

I.1. Free Wandering. This term, adopted from Henderson (1976:40, Table 4), indicates a lifeway in which a group wanders freely over the countryside in search of resources. A particular habitation site may be used for a day or perhaps for months; but it is not used repeatedly because the group is not restricted to a given territory. This strategy obviously requires a low population density (with a concommittant lack of competition for resources), and may lack any ethnographic counterpart.

I.2. Restricted Wandering. This term, also used by Henderson, implies seasonal wandering in search of resources within a specific territory. Even if the same locations are not reused annually, they are likely to be used a number of times over the years because of the limited number of options available to the resident population. Knowledge of certain locations as "good" or strategic ones may also be a factor in site reuse.

I.3. Central-based. Again a term used by Henderson, here defined as relying on a single, often-used "base camp" from which excursions to smaller, seasonal or special-activity camps are made. The model is much like the "Optimal Utilization Model" mentioned earlier; it is further defined here as having a base camp used by a composite social group and smaller, "exploitation camps" utilized by subgroups within the base camp group (MacNeish's [1964] "macroband-microband" distinction).

I.4. Small-village Sedentary. Habitation is based year-round in villages containing one or two small social units. From these sites, trips are made to other locations on a short-term basis to carry out specific and limited tasks.

II. Functional Variability in Sites. Although it may not be possible to establish the material correlates of a given function in every case, an obvious preliminary step is to define the functional categories which are likely to be present.

II.1. Opportunistic Activity Loci. As in our own society, a certain amount of prehistoric behavior must be seen as reactions to unanticipated events. Alternately, some one-of-a-kind acts occurred which, though planned, were not associated with other behavior. While not entirely random, they are probably the most difficult type of remains to anticipate spatially. They include:

II.1.a. Kill/Butchering Sites. Remains could include bone from the butchered animal(s), discarded points or butchering tools, and limited chipped stone indicating the ad hoc preparation of tools from a handy stone.

II.1.b. Plant Food Procurement/Processing Sites. These sites could include isolated hearths or burned rock concentrations, discarded ground stone, and plant-related chipped stone tools.

II.1.c. Lithic Procurement/Processing Sites. Remains would include cortical flakes, cores, and other discarded material from testing and initial reduction of local stone.

II.1.d. Travel Campsites. These are one-time campsites during travel. While they might contain a hearth, a pot break or two, and some chipped stone, remains should indicate both a limited amount and range of behavior.

II.2. Recurrent Activity Loci. These are sites in which repeated visits are made in order to perform the same tasks. The main factor distinguishing them from opportunistic activity loci is the amount and density of remains, and (sometimes) the existence of stratigraphy or other evidence for long-term but limited use.

II.2.a. Lithic Procurement/Processing Sites. The remains would again include cortical flakes, cores, and other discarded material from testing and initial reduction of local stone.

II.2.b. Lithic Workshops. These represent locations where stone is brought in from off-site and tools are prepared; those tools are in turn taken somewhere else for use. Remains would include cortical and interior flakes, thinning flakes, and broken incomplete tools.

II.2.c. Plant Food Processing Sites. Here, plant foods are brought again and again for preparation. Classic examples include large circular rock middens (built up by many episodes of use) and bedrock mortars.

II.2.d. Hunting Blinds. The assumption here is that any blind substantial enough to survive archaeologically was not an ad hoc construction, but intended for multiple use.

II.2.e. "Field Houses". These are defined as 1-2 room structures used for temporary habitation near agricultural fields. Though not specifically recognized for this area, these features are included here because of their belated recognition in other parts of the Southwest.

II.3. Habitation Sites. In such sites, remains from a wide range of activity may be expected, including remains from sleeping areas, food preparation and consumption, variable amounts of food and water storage, and craft production.

II.3.a. Single-use Sites. These are habitation sites used for days, weeks, or even months, but then abandoned and not reused. Once occupational intensity is controlled for, archaeological evidence should indicate such single occupancy.

II.3.b. Multiple-use Temporary Small Sites. These are habitation sites used on an occasional or seasonal basis but revisited on many occasions. A classic example would be a small but deeply stratified rock shelter site.

II.3.c. Large Perennial Seasonal Sites. These serve as "home" during a significant part of each year, year after year. Semi-permanent structures, storage pits, and extensive trash indicating a full range of activities can be expected. Such sites are often termed "base camps".

II.3.d. Small Permanent Sites. Such sites are used most or all of the year, with short trips to special activity sites only as needed. Extensive trash and permanent structures or features can be expected.

III. Activity Siting (Regional). From the literature cited, some variables for the region of the Two Rivers study can be defined. It should be noted, however, that the actual study area encompasses only one biotic community and general physiographic "province". Therefore, the study area remains can only be used as a partial test of these variables.

III. 1. Biotic Communities. Five major biotic communities occur in the Hondo drainage (Kuchler 1966), but only one is found in the study area.

III.1.a. Gramma-Galleta steppe. This is the community present at Two Rivers Dam.

III.1.b. Gramma-Tobosa shrubsteppe. This is found just south and east of the study area.

III.1.c. Juniper-Pinyon woodland. This and the remaining communities are found in the mountains west of the study area.

III.1.d. Pine-Douglas Fir forest.

III.1.e. Southwestern Spruce-Fir forest.

III.2. Physiographic Provinces. The distinction made here reflects the fact that humans can easily cover many kilometers in a day's travel. The entire study area must be considered within easy reach of what was once a live stream.

III.2.a. Less than 2 km from a Live Stream.

III.2.b. More than 2 km from a Live Stream.

IV. Activity Siting (Local). The topographic distinctions usually employed by archaeologists (for example, "lowland" versus "upland" areas) are probably not detailed enough to allow a precise understanding of activity siting decisions. Here, five categories relevant to the study area are defined:

IV.1. Active Floodplains. These are areas which were subject to frequent flooding during the time of occupation.

IV.2. Alluvial terraces/knolls in (or edges of) valleys. While past studies have noted sites in the Hondo Valley "bottom" (e.g., Wolfe 1931), it has not always been clear whether the sites were in actively flooded areas (IV.1), or on slight rises or terraces which would be less subject to flooding (IV.2). This difference is worth noting, as it might allow predictions of site location based on minor differences in topography within "valley bottoms".

IV.3. Hillslopes. These are slopes which are steep enough to interfere with most activities.

IV.4. Flat spots, saddles, or knolls in hills. These are flat areas in hilly terrain which may include local high spots, but which are not exposed in all directions and which do not have a broad view of the surrounding country.

IV.5. Hilltops. These are crests of hills or ridges, and are exposed and have panoramic views. The distinction between IV.4 and IV.5 is not always considered; it represents the difference between a sheltered spot in upland areas, and one which is exposed to the wind and weather but is stratigraphically located. Thus, for example, one can distinguish situations when so-called "hilltop" sites are actually slightly off the crest, in protected flat spots (cf. Hester 1977:126).

These categories are by no means exhaustive, but provide a realistic starting point for the Two Rivers study area and its

surroundings. The next step is to articulate the variables in terms of logical expectations that can be tested against the archaeological record. These expectations are summarized in Tables 1 and 2, and are justified briefly below.

#### Site Location Predictions

To begin with, we predict that opportunistic activity sites, by their very nature, are likely to occur in all adaptive strategies and in all locations. One may predict, then, that they are likely to be found by almost any survey, but it is more difficult to predict variability in their distribution. Moreover, while diagnostic artifacts may sometimes be found at such sites, they are perhaps best thought of as universal rather than time- or culture-specific remains.

We hypothesize that recurrent activity loci would not be typical of a free-wandering group, because that adaptation is not based on repeated use of one area. However, they would characterize the other three adaptations, which do make repeated use of a given territory. Field houses, as agricultural activity sites, would be further restricted to central-based or (more probably) small-village sedentary adaptations, as agriculture (at least of that intensity) and more mobile adaptations are generally incompatible.

In terms of habitation, single-use sites are the obvious correlate of a free-wandering adaptation; as conceived of here, such groups would be unlikely to reuse sites. Multiple-use small temporary sites could represent either the seasonal stations of a restricted wandering pattern or the "exploitation camps" allied to a larger "base camp" within the central-based pattern. Large perennial seasonal camps are the correlate of the "base camp" portion of that same pattern; small permanent sites are the correlate of a small-village sedentary approach.

We may also suggest likely locations for the functional types. As noted earlier, opportunistic activity loci may be expected in all but the most forbidding terrain; any variation in their distribution is not predictable as the model stands. Some variability can be expected for recurrent activity loci. Lithic procurement and initial processing sites will be where there is chippable stone, without regard to regional or local siting factors; one may predict the location of such sites if one knows where the raw materials are, but not otherwise. Lithic workshops and plant food processing sites both draw resources which could occur in any topographic setting, but for the sake of convenience or practicality will tend to be sited on non-sloping areas. Also, because of wind, we predict that these two site categories will be absent on hilltops (see Hester 1977:126).

Hunting blinds will occur where topographic variation provides a good vantage point or restricted route for game. Such loci are possible anywhere out of a floodplain. Field houses, in contrast, are to be expected in a floodplain or on adjacent terraces, but (in this area, at least) not in any hill setting.

TABLE 1. ADAPTIVE STRATEGIES AND PREDICTED FUNCTIONAL SITE TYPES.

(Note: Numbers used refer to those in text)

<u>Site Functional Type</u>	<u>Adaptive Strategy</u>			
	Free Wandering	Restricted Wandering	Central-Based	Small-Village Sedentary
II.1a-d	X	X	X	X
II.2a-d		X	X	X
II.2e			X	X
II.3a	X			
II.3b		X	X	
II.3c			X	
II.3d				X

TABLE 2. SITE FUNCTIONAL TYPES AND PREDICTED LOCATIONS.

<u>Site Functional Type</u>	<u>Riverine Locations</u>					<u>Non-Riverine</u>
	<u>IV.1</u>	<u>IV.2</u>	<u>IV.3</u>	<u>IV.4</u>	<u>IV.5</u>	<u>(any)</u>
II.1a-d	X	X	X	X	X	X
II.2a	X	X	X	X	X	X
II.2b,c	X	X		X		X
II.2d		X	X	X	X	X
II.2e	X	X				X
II.3a	X	X		X	X	X
II.3b	X	X		X		X
II.3c	X	X				
II.3d		X				

Habitation sites have the most restricted predicted distribution. In no case are they expected on hillsides where slope would interfere with domestic activities. Single-use sites are to be expected in any other setting, however; because they are to be used only once, they need not be sited with any special care. Hilltop sites may actually be advantageous despite wind, because the panoramic view they offer could assist foragers with a general rather than local knowledge of resources. Multiple-use temporary small sites would be sited carefully in relation to one or two resources; depending on what those resources were, the sites could be in the active floodplain (an undesirable place only during flood periods), terraces/bases of hills, or knolls or flat spots within the hills. (Hilltops would be less desirable because of wind.) If the distribution of key resources were known, likely locations for related sites could be more precisely defined.

Large perennial seasonal camps are most likely to be near live streams, given the water demands of a large social group over a large part of a year. Such locations would also provide the extensive flat areas needed for a large settlement. Terraces and the bases of hills are also likely places for such sites, for the same reason. Active floodplains are also likely, if the occupation period was scheduled around flood season; this location might even have the attraction of being flushed clean between occupations. "Finally, small permanent sites are more likely to be found [in this area] on small rises, terraces, or bases of hills just out of the floodplain." The basic need is to be near farmland; but floodplain sites are less likely because of the potential damage to permanent structures by floods.

Because the study area is restricted to Grama-galleta steppe in a "riverine" setting, regional siting variables will not be explored at length. We may note, however, that all functional site types discussed are likely to occur in non riverine areas as well, with the exception of large base camps and small permanent villages; these latter two categories are seen as strategies linked to dependable water supplies.

The logical statements just made (and summarized in Tables 1 and 2) link (1) general adaptive strategies to specific site types; and (2) functional site types to specific locations. By simply linking the logical statements, it is possible to generate a predictive model of site location according to adaptive strategy. For example, a free-wandering adaptation implies single-use sites, which should occur in floodplains, on terraces or the foot of hills, in flat spots or knolls in the hills, or on top of hills. It also implies several kinds of opportunistic activity loci, which could occur anywhere. Rather than complete all the linkages verbally, we have summarized them in Table 3.

TABLE 3. ADAPTIVE CHANGE, SITE FUNCTIONS, AND SITE LOCATION  
THROUGH TIME.

Adaptive Strategy	Culture(s)	Functional Site Types	Site Locations
Free-wandering	Paleo-Indian	II.1a-d II.3a	all IV.1,2,4
Restricted-wandering	early/middle Archaic	II.1a-d; 2a II.2b,c; 3b II.2d	all IV.1,2,4 IV.3-5
Central-based	late Archaic, early Ceramic hist. Indian	II.1a-d; 2a II.2b,c; 3b II.2e; 3c	all IV.1,2,4 IV.1,2
Small-village sedentary	late Ceramic	II.1a-d; 2a II.2b,c II.2d II.2e II.3d	all IV.1,2,4 IV.3-5 IV.1,2 IV.2

Of course, post-occupation factors such as erosion may alter the existing pattern of sites. These factors will be noted where possible, but at this early stage of model-building they are probably not crucial.

#### Adaptive Changes Through Time

The reader may have already noticed that the four adaptive strategies posed by the model can be linked to stages in Southwestern prehistory. The following section postulates an adaptive strategy for each historical period in the Two Rivers area, thus completing the initial model building effort and providing concrete expectations which can be tested archaeologically.

Paleo-Indian. As Jelinek (1967:140) notes, "...the chances for an in situ Paleo-Indian sequence are slim." Low Paleo-Indian population density, combined with substantial deposition and erosion in the last 8000 years, makes finding sites for this period very unlikely. If found, however, they should correspond to a "free-wandering" adaptive strategy (that is, one not restricted to any particular territory) (see Table 3). We may note that on the Llano Estacado, major Paleo-Indian kill sites were at the edge of streams or ponds, with the

campsites on top of a nearby knoll or elevation (Hester 1975). Thus, while we hypothesize that Paleo-Indian sites, if found, could occur in any of the locations listed in Table 3, a more restricted distribution may actually occur.

Archaic. Henderson (1976:40, Table 4) considers the Archaic to be characterized by a restricted wandering pattern. While this is likely for the early and middle Archaic, by the late Archaic a pattern of central-based wandering is more likely. (An important example of a late Archaic "base camp" is described by O'Laughlin [1980]). We therefore hypothesize that site distributions will be different from early to late Archaic; a likely source of this difference is the change in climate from Altithermal to Meditermal times.

Formative. In the vicinity of the study area, small permanent villages are known to occur from roughly A.D. 1200 onwards (Kelley 1966; Speth, 1981 personal communication). We hypothesize that the same pattern will be found in the study area itself. Before A.D. 1200, we hypothesize that ceramic-using groups (present by A.D. 900 or earlier) would practice a continuation of the earlier, central-based pattern. While Jelinek postulates that agriculture is present in the Middle Pecos Valley by Early 18 Mile times (1967:142), his data are still consistent with our reconstruction. Henderson (1976:40, Table 4) specifically interprets the Brantley Reservoir ceramic-period adaptation as being limited-range restricted wandering.

Historic Indian. Henderson (1976:40, Table 4) interprets the Mescalero as being central-based. Given ethnohistoric data such as the 1849 observation cited earlier in this chapter, we can only agree. We further hypothesize that Mescalero sites, if identifiable, will be at one or more of the corresponding locations listed in Table 3.

Historic European. Although the predictive model which has been proposed is clearly concerned with aboriginal remains, some comments on European site location are in order. A Hispanic American settlement is unlikely in the study area, with Plaza de San Jose so close by. Limited remains related to activities at the Plaza are possible, but given conflict with the Mescalero, isolated outbuildings or task areas are unlikely.

Early Anglo-American activities should center on livestock raising. Given the importance of the Hondo as a route for driving cattle, remains from temporary camps may be expected. Remains after 1880 may include line shacks, homesteads (primarily for perfecting claims rather than serious occupation), temporary camps, corrals, and so on.

#### Research Design--Final Comments

The predictive model which has been developed is qualitative; no prediction as to the numbers or densities of sites is made. That additional step can come only when quantitative data on site

occurrence become available. So far such data have not been obtained, as can be seen from the review of previous research earlier in this chapter. We must hope that such data will, in fact, become available, so that predictions of site location can be made for the use of archaeologists, planners, and resource managers.

## CHAPTER 5 METHODOLOGICAL BACKGROUND

In this chapter, a summary of field methods is presented. In addition, an overview of lithic resources and lithic technology in the survey area is provided. The second section anticipates Chapter 6 ("Survey Results") somewhat, but is provided here to serve as background material for site descriptions. This is done because, in the Two Rivers area, chipped stone is the most important type of artifactual remains. Other kinds of remains, such as pottery, were evaluated using standard southwestern terminology. The reader should also check the glossary in Appendix 1.

### Field Methods

The actual survey involved a four-person crew, spaced at 25-m intervals, zigzagging within this interval, and covering the survey area in a series of contiguous transects. These transects were usually oriented north-south or east-west to conform to the layout of the survey area, but at times other orientations were used in order to match local topography. To prevent gaps or overlaps, each set of transects was limited by features such as roads, or marked temporarily with flagging tape. Also, to ensure even coverage, the "outer" person on each transect flagged that edge of the survey line as she/he proceeded; at the end of the transect the crew "flipped over" and the same person retrieved the tape on the way back. We found this technique to be as good as compass bearings in maintaining even coverage in this open country.

Sites and isolated finds were distinguished in terms of the definitions in Appendix 1. Both sites and isolated finds were recorded on Laboratory of Anthropology field forms. Field site numbers were prefixed with TRS- and isolated finds with IF- (thus, for example, the sixth site found was labeled TRS-6). All field notes and photo logs were kept in terms of these field numbers.

When a find was made, crew members marked their survey positions with flagging tape and regrouped at the find. Once site boundaries were determined, a datum was set and field forms and photos were prepared. On many sites, so few items were present that simple artifact counts or estimates of artifact density were made. In some cases, however, site density and integrity allowed use of formal transects for counting. These consisted of 1-m squares at 10-m intervals (5 m at LA 33118); in some cases four transects at right angles, centered on the datum, were used. All cultural items in such squares were counted, the transects ending when no more items were found.

In two cases, concentrations of cultural remains were located in zones of very sparse burned rock and flakes. During fieldwork, the concentrations were recorded as separate finds, but they were later combined as loci within sites (LA 33104 and 33106). The boundaries of

the latter, as defined after fieldwork, included the low-density remains.

Site depth was estimated by inspection of the ground surface and of natural and mechanical disturbance areas. Using this approach, we discovered that sites were either superficial or deeply buried, so subsurface shovel tests were not done.

Most sites were marked with a piece of rebar (as the datum), with a metal tag attached. (The tag noted the site number and date of survey.) On the remaining sites, the tag was attached to a pre-existing object that would be easier to relocate than the rebar.

The field records for sites included a sketch map of each site. On this we noted site extent, features or concentrations (if any), disturbed areas, the datum, topography, and other relevant information. All sites and isolated finds were photographed but unfortunately, the heavy grass cover limited the value of this kind of record. No artifact collections were made.

It quickly became apparent that location could be determined easily by comparing the Corps-supplied orthoquads (at a scale of 1:4800) to local topography. Moreover, an accuracy to within a few meters (at worst) was possible with this method, supplemented as needed with a compass bearing or two. Consequently, only orthoquads were used in the field, with locations of finds then transferred to USGS quads each evening.

Once a site was recorded, the crew members returned to their marked locations and continued the transect until it was completed. As work progressed, the crew noted geomorphological features which might be useful in reconstructing paleo-environment. In addition, a soil profile near the Rio Hondo was recorded and pollen samples were taken from it (see Chapter 5 and Appendix III).

#### Lithic Technology of the Two Rivers Area

The lithic artifacts encountered as isolated objects or assemblages of archaeological sites were identified and analyzed in situ. Identification of tools were made according to standard types. Flakes and cores constituted the balance of the lithic artifacts and were also identified using standard types and morphologically descriptive terms. The tools, cores and flakes were also identified within a technological context which includes the full use-life of each respective piece of stone. These are all products or byproducts of manufacturing and use which must be considered in studies of typology and function. Stages involved include selection or procurement of materials, initial stage manufacturing of flakes from cores, simple tool shaping (i.e. scrapers) and preforming of more complex items, secondary trimming and shaping (i.e. hafting elements), tool use, tool maintenance and resharpening, tool discard and post-depositional

disturbances (Collins 1975:19-23). For our purposes, we simplified this with a dichotomy between tool production and tool use (byproducts vs. products) and by identifying the physical nature of the stone material being used.

Following are sections in which we describe the local stone materials used, define the tool, flake and core types identified and discuss the stone manufacturing technologies observed. The isolated objects are also presented below but discussion and descriptions of individual site assemblages and artifacts are presented with the text sections dealing with the sites themselves.

### Lithic Resources

Any lithic technology is controlled or limited by the physical nature of the raw stone materials being used. To develop an understanding of a lithic technology and the settlement/subsistence system in which it functioned, it is important to delineate the variables influencing these assemblages. The specific physical variables which are most important are the size, shape, distribution, availability and quality of the stone. These variables affect the extent to which a stone can be exploited, the manufacturing technique which can be used, and the type or function of tools made. Thus for each stone type identified, we made an effort to identify a geologic origin, describe the important fracturing characteristics and examine patterns of exploitation.

The stone types identified in the archaeological sites of the study area can be categorized into groups of (1) locally obtained stone types; (2) non-locally obtained stone types of an unknown source; and (3) non-locally obtained stone types of a known point of origin. The materials from an unidentifiable source cannot be used to any great extent in this study but are described primarily to provide leads to other researchers. Stone types of known origins allows evaluation and description of certain aspects of the acquisition part of the lithic technology.

Locally available stone types include a variety of cherts eroding out of the local limestone hills and stream pebbles exposed in deposits on the valley floor. The cherts are of a variety of colors, shapes and interior structures. Some localities produce only specific and limited types of chert but others are more variable. The extent to which this variety reflects derivation from specific different geologic strata is unknown. Chert coloration is widely variable but there are some consistent patterns of homogeneous colors or specific combinations and patterns of colors. The more common patterns are listed below in Table 4.

In all areas where chert nodules were concentrated on the surface, some type of prehistoric knapping/exploitation was seen. Chert deposits were apparently exploitable only where exposed by erosion of the

TABLE 4. DESCRIPTIONS OF TWO RIVERS CHERTS

<u>Color and Pattern</u>	<u>Form</u>	<u>Texture</u>
Cream to gray with distinct bands of dark gray to dark brown. Bonding is lamellar, often missing in interior part of nodule. Bands range between 2 and 15 mm thick and often more; subject to weathering erosion. Opaque; smooth light brown cortex; orange patina.	Rounded to globular nodules (2-8 cm in diameter).	Medium to fine grained.
Dark gray to tan with spots, mottling or veins of light brown to orange. Small irregular veins of agate. Opaque to semi opaque. Thin dark vesicular cortex.	Globular nodules to tubular (2-5 cm thick).	Agate veins but otherwise fine grained.
Light gray to brown with small darker spots, white agate olites and vugs. Opaque to semi-opaque; thin but irregular light cortex.	Various nodules (3-25 cm in diameter).	Fine to very fine grained.
Cream to light gray with few inclusions. Thin, smooth light brown cortex.	Rounded, irregular nodules (3-5 cm in diameter).	Fine grained.
Opaque, dark brown to black or olive with red to white agate; semi-opaque inclusions and light brown semi-translucent patches. Thin, lighter vesicular cortex; often variegated colors.	Rounded, irregular nodules.	Medium to fine grained.
Brown to light gray with subtle mottling or swirls. Smooth tan to reddish brown cortex; orange colored patina.	Rounded to globular nodules (1-5 cm in diameter).	Course to fine grained.

limestone matrix. There was no evidence observed to indicate any quarrying to obtain chert. However, density of chert nodules on the surface is, to a certain extent, dependent upon topography and surface morphology. The topographic conditions which fostered accumulations of chert nodules include hill crests, saddles, benches and lower hill slopes. Most of the chert concentrations were situated on lower hill slopes.

Reference to texture of materials in Table 4 are generally indicative of suitability to flaking. Fracturing of a very fine grained material can be more carefully controlled by the knapper than a coarse grained chert. For purposes of this evaluation, very fine grained chert has a smooth fracture surface approaching that similar to glass. Coarse grained chert has particles large enough to be seen without magnification. Other terms of fine and medium are subjective terms describing intermediate textures.

The other local stone material are stream smoothed pebbles and cobbles in deposits on the valley floor. Many of these vary being remnants of Pleistocene deposits; many are more recently redeposited. These stones are of mixed igneous or metamorphic origins and range from sand size to 50 cm in diameter. Finer grained stone types as basalt and graywacke were more frequently selected for chipping; soft and more coarse textured stone such as sandstone and quartzite were selected for use as grinding implements. These cobble bearing deposits are exposed intermittently in arroyo banks, terrace remnants, upper margins of the valley floor and the active channel of both the Rio Hondo and Rocky Anoyo.

The only identified non-local chert is Alibates Flint (silicified dolomite) originating from the central Texas Panhandle some 400 km (250 miles) to the northeast (Bryan 1950:14; Shaeffer 1958).

Very few nodules larger than 10 cm in diameter were observed in the nodule concentrations. Most of the parent limestone formations have been highly fractured, reducing most nodules into numerous fractured pieces. A combination of small size and fracture damage makes the vast majority of the exposed chert nodules unsuitable for more formal lithic reduction techniques, and greatly restricts the range of tools that could be manufactured. Such knapping techniques as were apparent and the end products, the tools, are described in the next section.

#### Lithic Technologies

The nature of the stone resources available have a strong influence on the manufacturing process and the finished products. Large bifacial knives cannot be made from small chert pebbles. There are, however, certain different options generally available to the knapper to achieve a given desired result. Selection of a particular option may be culturally determined and thus is of potential value in

cultural studies. Use of a particular lithic reduction/manufacturing process often results in distinct attributes on both the products and byproducts. Just as particular styles of tools (products) can often be identified to a particular temporal period, the flakes, cores and debris (byproducts) can often be identified and dated (Bandy 1976; Green 1963; Patterson 1977). Unfortunately the technological data base upon which such applications are based are not as well developed as tool typologies and considerable background research is generally required before reliable results can be obtained. To attempt detailed considerations of the lithic technologies in these study assemblages is clearly well beyond our means but some general identifications are relevant and were made.

All stages of lithic technology were represented ranging from raw material procurement to discard/loss of a tool after use. Likewise represented were various specific manufacturing strategies and specialized use of different stone types. These include the production of blades, sequence flakes, general flake blanks, bifacial tools and choppers. Each of these products is defined in Appendix 1 and described below.

The first three products are technologically very similar. All of those are types of flakes from which the byproducts are spent cores, flake rejects or manufacturing failures and various forms of core trimming or error recovery flakes. Blade and sequence flake production are strongly restricted to specific core shapes and result even then only from very patterned flake removals.

Sequence flakes are detached by a series of blows progressing down one side of the nodule. The natural outer cortex of the nodule served as the striking platform and all detachments were made in close linear association down the same side of the core. Elongated and rather round or cylindrical nodule shapes are needed to utilize this technique. Typical in Late Prehistoric West Texas sites (Epstien 1963; Bandy, Skinner and Turner 1980), sequence flakes occur in a few Two Rivers sites; however, does not clearly imply similar temporal/cultural associations to this area.

Blades are produced from cores with a flat circular striking platform, all blows delivered near the edge over linear ridges down the long side of the core and generally in a laterally progressing pattern around the edge of the core. Blade production requires a conical shaped core with flat platform and a ridge down the side. This shape is usually produced by shaping a nodule which, with these local cherts, would result in rather small blades.

The predominant reduction technique is not well patterned to specific nodule shapes or core shapes. The main flake types produced are flake blanks. General flake blanks are defined here as those flakes which are relatively regular in outline and cross-section shape and large enough to function as stock for making flake tools, and is primarily the product of core flaking, excluding sequence flakes and

blades. Range of size, shape, platform preparations and detachment patterns is wide. The predominant objective seems to have been to remove as large a piece(s) as possible, often verging toward cobble splitting (Crabtree 1972:41) except that use of an anvil (bipolar flaking) was not evident. Strategy was largely controlled by shape of the nodule. It is also likely that both blade and sequence flake production were only fortuitous variations of this eclectic flaking, as good strong and consistent reduction patterns are not evident in either case.

Method of flake detachment from cores was probably by direct hard hammer percussion. Residual striking platforms on most flakes were generally rather robust, not specifically shaped to facilitate any type of soft hammer percussion and had pronounced ventral surface morphology or attributes (such as eraiblure scar, salient bulb of force and prominent compression rings) which generally result from direct hard hammer percussion (Muto 1971:79).

Bifacial manufacturing is represented by only a limited portion of the reduction. Bifacial cores generally tended toward biconical percussion cores (Crabtree 1972:39) with small size and thick cross section. Only a few specimens were apparently manufacturing failures/rejects (rough-outs or preforms) destined for actual thinning. Thinned bifacial tools were found in some sites the field study but bifacial thinning flakes (Bandy 1976), the manufacturing byproducts, were rare. This indicates that bifacial tools were not generally manufactured at the sites where they were used and discarded nor at any identified workshop. It should also be pointed out that the local stone resources were not particularly suitable to utilization of a biface core technology. Apparently most bifacial tools were imported into the study area in finished form.

The manufacturing of choppers is a distinct technology because of both techniques used and the almost exclusive use of graywacke stream cobbles. Flake detachment was made by hard hammer percussion but could have been applied by either a direct blow from a hammerstone or a block on block technique (Crabtree 1972:47). Graywacke is a very tough stone and considerable force is required to flake it. The block on block explantion seems particulary plausible because nearly all flake detachments were made from the stream smoothed surface and tended to be on the ends of elongated cobbles. These tendencies would be congruent with block on block, where the core (the object flaked) is the object put into position and the hammerstone is actually a stationary anvil. This could have been easily accomplished by selecting a suitable cobble and rapping it repeatedly on a nearby large cobble. Hammerstones were observed in the study assemblages but these were most often associated with flaked chert.

## CHAPTER SIX SURVEY RESULTS

The survey identified a total of 47 sites, as defined in the field, and 57 isolated finds. A review of the site data at the completion of fieldwork resulted in some sites being combined, bringing the final total to 36. Of the sites, 32 have Aboriginal components, 2 have Anglo components and 2 yielded evidence of both Aboriginal and Anglo activity.

In the following descriptions, some factors are assumed unless otherwise specified. First, because of the uniformity of the local environment, descriptions of on-site vegetation are not included. Second, all sites are subject to sheet erosion and grazing to minor degrees; additional sources of disturbance are noted if present, but not these. Finally, sites out of the valley bottoms are superficial: bedrock is on or near the surface. Any description which omits specific information about site depth should be taken as referring to a superficial site.

To protect site integrity, no map with site locations is provided. Copies of maps with site locations are on file at the Albuquerque District, Corps of Engineers, and at the Laboratory of Anthropology, Museum of New Mexico.

### Site Descriptions

#### LA 33091

This is a scatter of chipped stone, 35 x 30 m in extent, and located on a small knoll in the hills north of the Hondo. An estimated 30 artifacts are present, including cores and flakes. Cores consisted of tested nodules, core fragments, and simple cores. Core preparation was minimal, with no consistent flaking patterns. Chert nodules occur naturally on the site. Remains are from procurement, selection, and initial processing (flake production) of the locally occurring "fingerprint" chert.

#### LA 33092

This site was found on top of a low ridge finger just out of the Hondo valley bottom, and consisted of cores and flakes in a 15 by 15 m area. Five 1 m transect squares yielded a total of 1 core, 1 primary flake, and 2 secondary flakes, as well as 23 natural pieces of chert and one recent beer bottle fragment. The only activity represented is procurement and initial processing of naturally occurring "fingerprint" chert.

#### LA 33093

A lithic scatter, LA 33093 was found on top of a ridge overlooking the Hondo floodplain. It measures 4 x 2 m and contains 1 core and a dozen flakes. The core is a rounded nodule; flakes were struck from the convex cortical surface, progressing around the full circumference of the nodule. Distal ends of the scars converge to form a conical core. Cortical,

of three different local colors of chert. Flakes are generally less than 1 cm in maximum diameter; interior flakes are small fragments indicating manufacturing debris. Presumably, larger and more complete flakes were removed for use elsewhere.

LA 33094

This site is a scatter of chipped stone measuring 4 x 3 m; it is located on the same ridgeline as LA 33093. Two cores, 8 flakes and 1 biface are present. The cores both have a few flake scars with cortex platforms. The flakes are all fragments but probably represent both cortical and interior flakes. The biface is an irregularly flaked piece of local chert. The assemblage probably represents the remains of a lithic workshop.

LA 33095

A 12 x 3 m scatter of 7 artifacts was found on the same ridge as the previous two sites, but in this case just off the ridgeline. The artifacts include 3 tools (a denticulate uniface, a thinned biface fragment, and a scrapper), a core, 2 flakes, and an apparent manuport. The chipped stone is made from varieties of local chert, the core and flakes being of "fingerprint" chert available nearby. Both unifaces are extensively flaked, with all edges prepared for use as a tool. The manuport is a small pebble, of valley floor deposit origin. The presence of non-local materials and formal tools at this site indicates that some specific (but unknown) task was carried out.

LA 33096

One core and 8 flakes were found in a 2 x 2 m area, on the crest of the same ridge as the previous few sites. Material is "fingerprint" chert; the core shows complex flaking from several angles, using prepared platform surfaces. The flakes, probably all from this core, are up to 4 x 6 cm in size and are circular to elongated blades in shape. Initial reduction of one core and selective removal of flakes is indicated.

LA 33097

This site is on a hillslope overlooking the Hondo floodplain. It consists of cores and flakes in a 2 x 2 m area, and probably represents a lithic procurement/processing locus. All 4 cores are only partly consumed. The 6 flakes were all cortical or secondary and all were small, irregular, or fragmentary, indicating that the larger flakes struck from these cores had been removed.

LA33098

Located on the edge of the Hondo floodplain, this site is badly disturbed by cut and fill work. Artifacts include 1 thinned biface fragment, several irregular bifaces, and about 25 flakes. The thinned

biface is made from purple quartzite. The rest of the chipped stone is of several varieties of local chert. Technologically, the chipped stone appears to represent several knapping activities, including general knapping and tool use. Absence of cores implies that most flakes were not produced at the site.

The site measures 80 x 40 m and includes a light scatter of burned rock, especially at the site edges. Depth is unknown; it is possible that the visible remains are a churned-up portion of a more extensive buried site. No exact function can be suggested, but some type of habitation is possible.

#### LA 33099

A 25 x 10 m lithic scatter was found on a low limestone ridge which protrudes from the Hondo floodplain. This assemblage contains 3 chert flakes, a hammerstone, a basalt mano fragment, a biface core fragment, and a Clear Fork Gouge (see Ray 1941). The gouge type is generally a subtriangular biface with a unifacially beveled or truncated end. It is attributable to Archaic cultures in Texas (Suhm 1958:80), and has been found in the nearby Texas Panhandle (Etchinson and others 1979:38). Although not well dated in the Panhandle, the gouge tool there may date from Early to Middle Archaic (5,000 - 1,000 B.C.) periods (Hughes 1976:4) as it does in central Texas, where it is a more common artifact. North of the study area, at Los Esteros, Mobley (1978:150) reports gouges, all datable to the Archaic period. The gouge at LA 33099 was made from local chert which patinates to an orange color. The lack of flakes suggests that lithic processing did not occur; alternatively, smaller and lighter items (flakes in particular) have been removed by sheet wash. Given the variety and limited number of remains, tentative identification as a campsite is made.

#### LA 33100

In a area 800 x 500 m in the Hondo Valley bottom, evidence for an extensive aceramic site were found (Figure 4). Most of the site appears to be buried by 30 to 50 cm of silt, but the site has been cut by the Hondo stream channel and a borrow pit, exposing the remains. Artifacts occur along the exposures, in areas just back from the exposures where erosion has been accelerated, and rarely in other spots. Over 15 burned rock hearths (concentrations) and a burned rock midden 3 m in diameter (Plate 5) could be defined, mainly along the stream channel. Scattered burned rock was also seen.

A variety of flake and tool types is present. Tools include unifaces and bifaces (mostly fragmentary) and one projectile point, a Scallorn. This type dates between A.D. 500 and 1200 (Suhm and Jelks 1962:285) in Texas and Oklahoma. It is found in similar contexts in the Texas Panhandle (New World Research 1981b:109; Hughes and Willey 1978) as well as in nearby Lea County, New Mexico (Leslie 1978:100). All observed lithic materials were probably of local origin except for

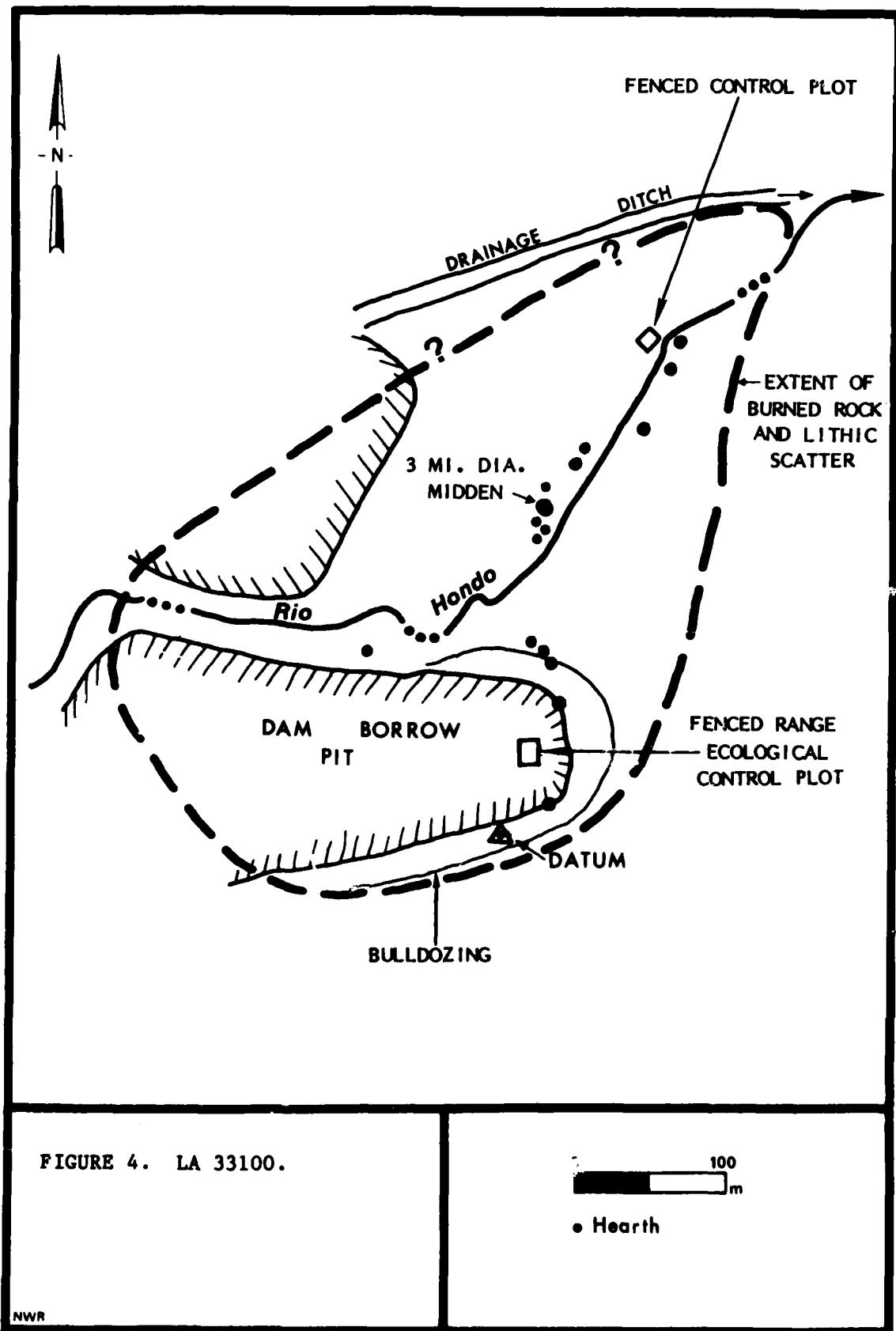




PLATE 5. LA 33100, BURNED ROCK MIDDEN. HONDO CHANNEL IN BACKGROUND.

several flakes of Alibates flint (Shaeffer 1958). This stone type was most intensely exploited and traded by Panhandle Aspect people (Bandy 1975:83) between A.D. 1300 and 1450 (Campbell 1976:10). Alibates flint is relatively common in some Middle Pecos sites known to date from that same time period (Mobley 1978:93). Presence of Pecos area pottery in Panhandle Aspect sites (Crabb 1968) substantiates that there was an active exchange association between the Pecos and Panhandle areas. Furthermore, obsidian samples from several panhandle Aspect sites have been traced to New Mexico (Mitchell et al. 1980:305). It is not so surprising then, to find Alibates at this and other Two Rivers sites. What is anomalous is the difference between the apparent late Archaic date of this site (pottery was not found despite the extent of remains) and the peak date for Alibates exploitation. It would seem that either this site is later than thought, or that effective contact between the Panhandle and Middle Pecos occurred well before A.D. 1300.

Because of the disturbed and buried nature of the site, specific artifact frequencies were not estimated; however, it was noted that

interior flakes were much more common than cortical or secondary flakes. No cores were noted, indicating that initial flake reduction was not commonly done at the site. This focus on later-phase lithic activity, combined with the size of sites, presence of hearths and scattered burned rock, and range of artifact types, indicates extended use of the site as a camp. Pieced of fresh water shell (Unionidae; possibly *Anodonta*) were found eroding from a cut at the site; these are discussed later.

#### LA 33101

On a low hillslope above the Hondo floodplain, 7 pieces of chipped stone were found in a 5 x 5 m area. They included simple cores and flakes from an initial stage of flaking (cortical and secondary flakes were present). The same poor quality chert occurs naturally around the site area; procurement and initial reduction activities are indicated.

#### LA 33102

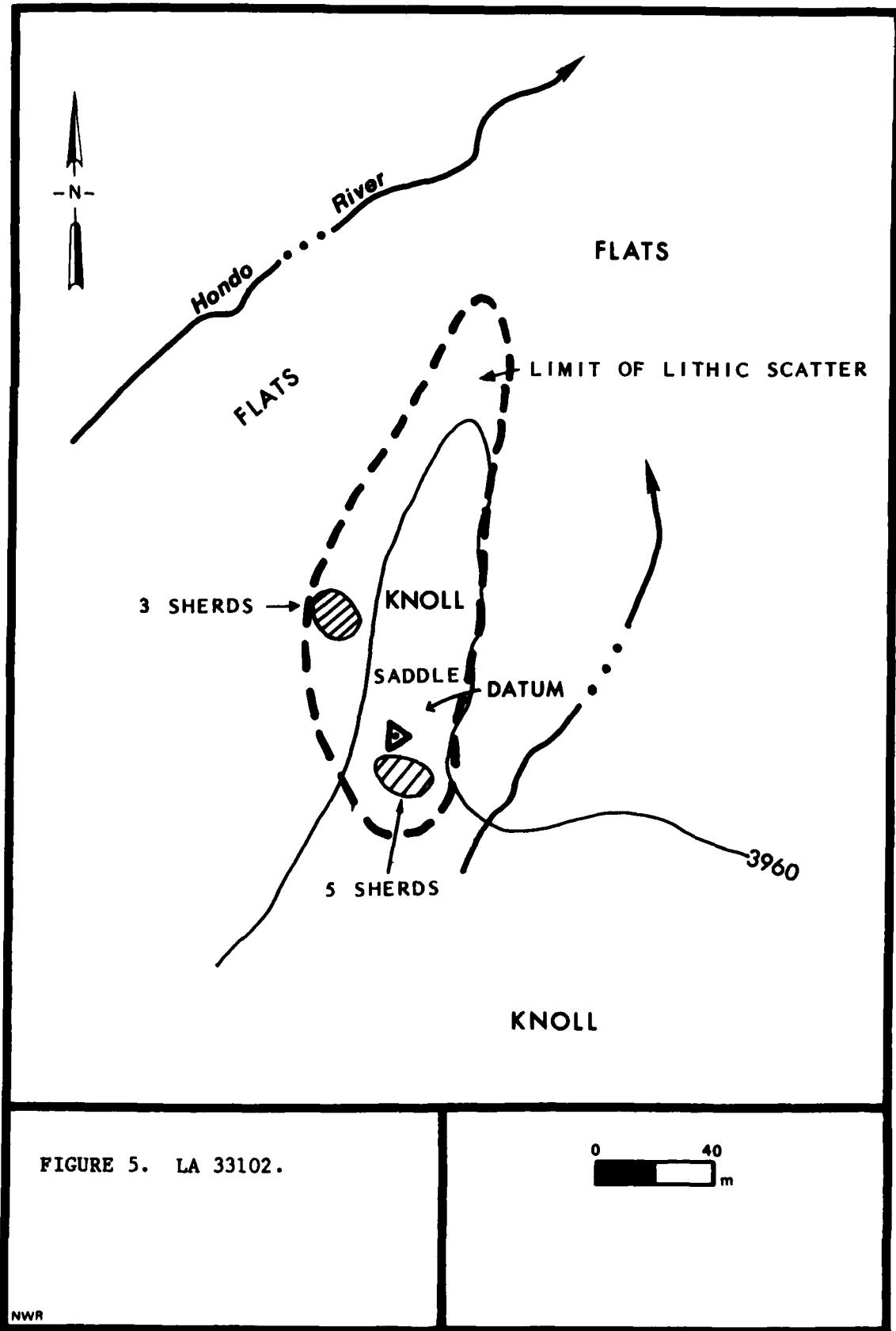
A low-density lithic scatter (Figure 5) was found covering a low ridge just out of the Hondo floodplain. Estimated lithic density reached 1 item/sq. m in spots but dropped to below 1/10 sq. m in other parts of the site. Within the scatter, 5 sherds from the same bowl (possibly Lincoln Black-on-red) were found in a slight saddle. Three additional sherds, probably from this same bowl, were found clustered on a slope some distance away. Chipped stone seemed slightly concentrated in the same spots as the pottery. Overall site size is 190 x 60 m.

Lithic items include secondary and interior flakes of at least six different stone types. These include Alibates flint, two local cherts, local limestone, and quartzite and graywacke pebbles in the valley terrace deposits. Such a diversity of stone types implies an eclectic lithic assemblage. The absence of cortical flakes and cores indicates that initial flake production was not carried out. The site may have functioned as a temporary camp.

#### LA 33103

This site runs parallel to the bank of the Hondo, near that river, and consists of materials eroding from the banks of a mechanical cut. Thus, both natural and mechanical disturbance has occurred, without which the site would be masked from view. As at LA 33100, much of the site is probably buried by silt; true depth and extent of the site are consequently unknown.

Visible remains cover 240 x 40 m, and extend for an unknown distance beyond the survey area boundary. A transect of 26 1-m squares (at 10 m intervals) yielded 41 pieces of burned rock, 22 interior flakes or fragments, 1 secondary flake, a biface fragment, a scraper fragment, a sherd of Jornada Brown, and a piece of burned bone. Chipped stone is of local chert. The combination of burned



rock, tools, and interior flakes indicate a habitation site; initial lithic reduction must have occurred elsewhere.

#### LA 33104

LA 33104 is located in the Rio Hondo floodplain, in the same area as LA 33100 and LA 33103. Indeed, the boundary between this site and LA 33100, a drainage canal, is arbitrary. Burned rock and isolated flakes are extremely rare around the demarcation chosen, but do not die out completely between the two sites. (It is worth noting that flakes can be seen eroding from the upper banks of the drainage canal, even though they are rare on the surface nearby.) LA 33104 appears to be younger than LA 33103; not only was pottery found, the remains seem to be slightly higher in the floodplain sediments. Whereas at LA 33100 remains were visible mostly in disturbed areas, here some remains occur on natural ground surfaces. Still, most of the remains are probably buried by at least 5-10 cm of silt.

LA 33104 measures 850 x 550 m and extends an unknown distance beyond the study area boundary. Disturbance includes borrow pit work and erosion along the Hondo stream channel. The site consists of a very low estimated density (1 item per 10 sq. m to 1/100 sq. m or less) scatter of burned rock and flakes (mostly interior), with a few localized surface concentrations (Figure 6). During the survey, these concentrations were assigned separate field numbers (and datum markers); here they will be redefined as loci. In general, the amount and diversity of remains indicates an extensively used campsite, probably some kind of perennial base camp.

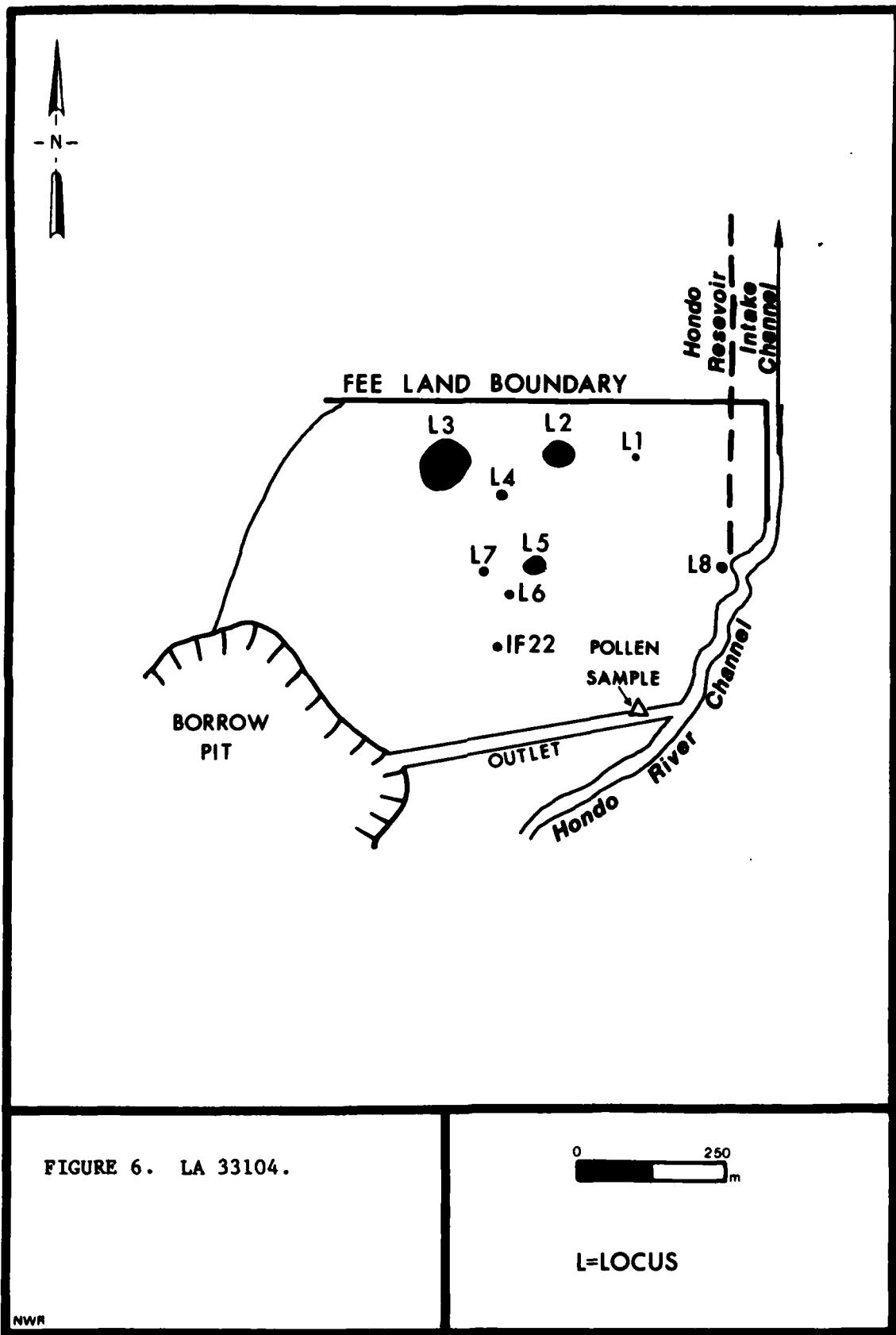
Locus 1. In a 10 x 10 m area, a sherd of Jornada Brown, a bifacial thinning flake, and a 5 m diameter scatter of about 12 burned rocks were found. Heavy grass cover made it difficult to locate items not buried by silt.

Locus 2. A slight concentration of items was noted over a 90 x 70 m area. Density was generally low, with a density of 1/sq. m or higher only in the 40 x 20 m central portion of the locus. Seven transect squares in that portion turned up 10 sherds of Jornada Brown, 13 burned rocks, and 1 cortical and 7 interior flakes of local chert. Two mano fragments were noted outside the transect squares.

Locus 3. Finds covered about 90 x 80 m but were very sparse. Estimated density of burned rock was 2-3 sq. m at the most, but usually less than 1/sq. m. One metate and one mano fragment were seen, along with about 25 widely scattered flakes.

Locus 4. In a 10 x 10 m area, 10 sherds of Jornada Brown pottery, 3 non-cortical flakes, and about 10 pieces of burned rock were found.

Locus 5. This concentration measures 30 x 25 m, and consists of a midden and associated scatter of burned rock. The midden consists of hundreds of burned rocks in a 10 x 10 m area, piled at least 15 cm



deep. The surrounding scatter has an estimated density of 1-2 burned rocks per square meter.

Locus 6. This locus consists of a burned rock midden and scatter, and also artifacts. The midden measures about 12 x 8 m; estimated density is over 100 rocks per sq. m. Burned rock density outside the midden is less than 1/sq. m, with decreasing density as one moves away from the midden. Chipped stone is also densest around the midden, with up to 1 item/ sq. m. Finds included a fragment of a shallow basin metate (of granitic stone), quartzite mano fragments, 2 blades of "fingerprint" chert, an interior flake of basalt, a small end scraper on a primary flake of orange patinating chert, an interior flake of limestone (?), and a small interior flake (possibly a trimming flake).

Locus 7. A burned rock concentration (est. 10-20/sq. m) was found in an area 10 x 8 m. Two blades, one bifacial thinning flake, and 3 unifacial tools were also found.

Locus 8. At this spot, flakes and burned rock are eroding from the banks of the Hondo, with erosion-induced concentrations of small flakes (about 5/sq. m) in low areas. Elsewhere, a much lighter scatter of flakes and burned rock (between 1/sq. m and 1/10 sq. m) is visible. Total extent of the locus is 50 x 30 m. The chipped stone is mostly thinning flakes or less commonly, secondary flakes. Most of the locus is probably buried by at least 5 cm of silt. A jeep trail passes through part of the site but apparently has not caused any damage.

Locus 9. This is a concentration 10 x 5 m in size, and containing burned rock (est. 1-2/sq. m), 3 interior flakes of local chert, and 2 mano fragments.

In addition, one item not associated with these loci was recorded as an isolated find. IF 22 is an unknown type of dart point. It is triangular with corner notches, prominent round barbs, and an expanding stem; the stem is well-flaked with a concave base. The point is thin and well-flaked, and is biconvex in cross-section. It is most similar to late Archaic Marshall and Marcos types (Suhm and Jelks 1962:208-211).

#### LA 33105

Located on a gentle hillslope just out of the Hondo floodplain, this site is a burned rock scatter covering 60 x 40 m. Estimated maximum density of burned rock is about 1/sq. m, decreasing downslope to 1/10 sq. m. A core fragment was the only artifact found. Function is uncertain, but this is most likely a single-use food processing site; sheet erosion has probably spread the remains about.

LA 33106

Like LA 33104, this site consists of a very low density scatter with occasional concentrations of remains (Figure 7). Unlike LA 33104, this site is out of the Hondo floodplain, on a limestone ridge, and is superficial. It appears that sheet erosion has scattered materials somewhat. The nature and variety of remains suggests that the ridge was a campsite; the thinness and extent of the scatter suggests recurrent but limited use, with shifts in the locations of activities. Total site size is 850 x 150 m.

Locus 1. This a sparse burned rock and lithic concentration, 200 x 80 m, along the top of the ridge. Three burned rock hearths, about 1 m across, were also found. Thirty-one 1 m transect squares (spaced 10 m apart) yielded 2 cortical flakes, 14 interior flakes, a core fragment, a tooth fragment, and 141 burned rocks. The chipped stone thus counted was all local chert; only one tool, a basalt scraper, was noted on the site as a whole. The large proportion of interior flakes indicates a low incidence of initial lithic reduction.

Locus 2. This locus is on the same ridge, but in a slight saddle; it measures 9 x 7 m. A small hearth (1 m across) is surrounded by a few stray pieces of burned rock. A side scraper, an end scraper, and a few secondary and interior flakes are also present.

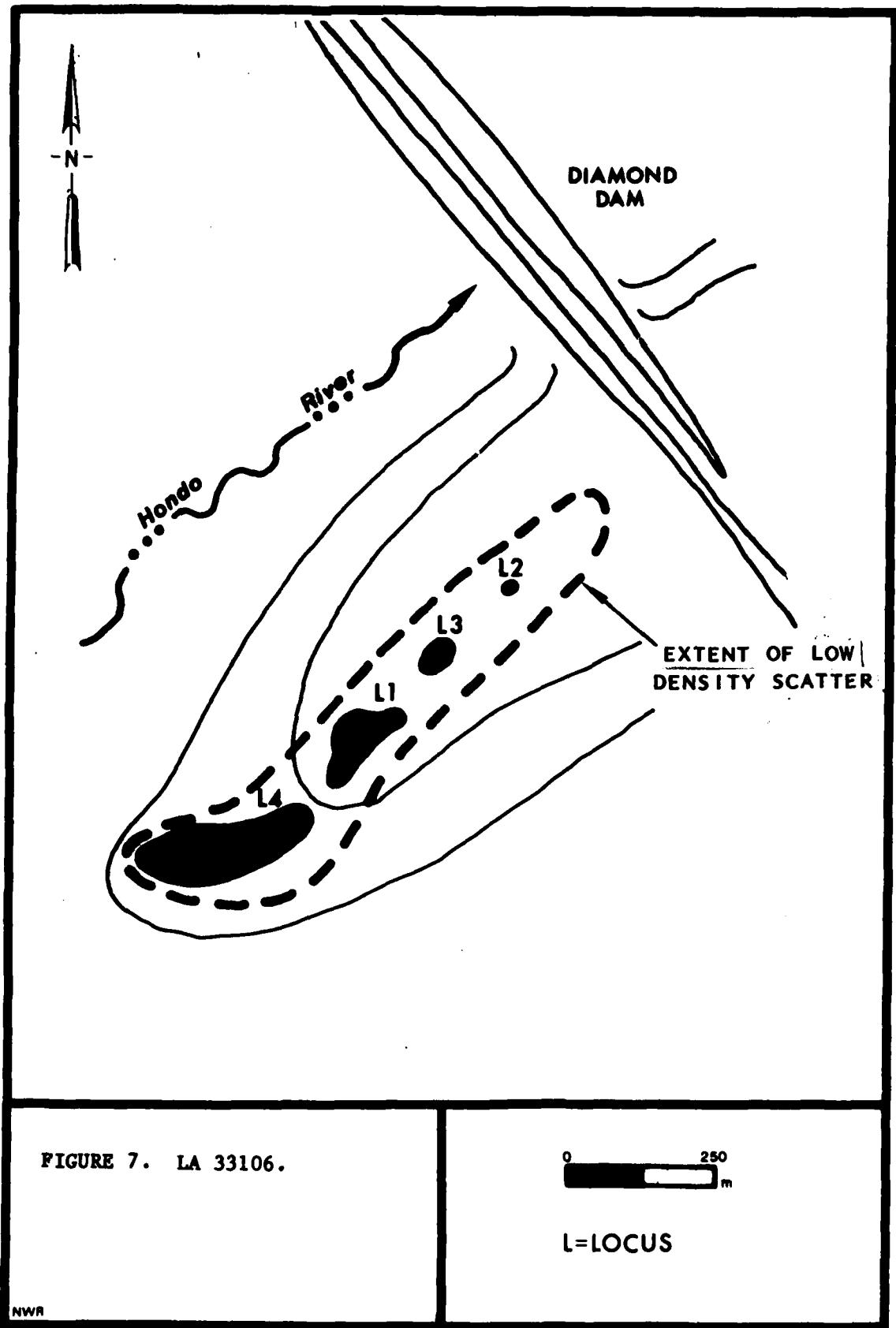
Locus 3. On a high spot on the ridgeline, a 40 x 15 m concentration of burned rock and artifacts was found. The site is cut by a jeep trail and is next to a bulldozed portion of the ridge slope. One hearth, about 1 m across, was found. Chipped stone is mostly interior flake of local orange patinating variety chert (however, one flake of Alibates flint was noted). Most of the flakes were 2-4 cm long, larger than most interior flakes at the other sites. Overall lithic density was estimated at about 1/3 sq. m.

Locus 4. As defined during survey, this site was the lower end of the ridge to the edge of the Hondo floodplain, but artifact density is quite low (estimated at less than 1/100 sq. m) except at the upper end of this "concentration". There, density is 1/sq. m or less; in the same area a small hearth (about 1 m across) was found.

At Locus 4, most of the chipped stone is local chert, especially the orange patinating variety. However, rare examples of Alibates flint and a white quartzite were also seen. Only flakes were found; these included roughly equal numbers of secondary and interior flakes.

LA 33107

This site consists of items eroding from a small dike near the Hondo River. The visible remains are clearly in a secondary context, but it is not apparent whether the original site has been destroyed or whether dike construction merely exposed part of a buried and more extensive site. The site measures 60 x 15 m, and includes burned rock and chipped stone.



Density of such items is estimated 1-2/sq. m at the east end of the site, and decreases to 1/5 sq. m at the west end. Flakes were the only artifact type noted; these were mostly interior flakes. Three stone types are present: local brown mottled chert (almost all examples), purple quartzite, and Alibates. The flakes are probably either associated with tool-using activity or are tools themselves. While the site is badly disturbed, it is possible to suggest that it was once a campsite.

LA 33108

A sparse lithic scatter measuring 80 x 40 m, this site is part of a broad, fairly flat hilltop. The particular spot chosen has a panoramic view of the surrounding countryside, which may explain its selection. A graded road passes through the site, but the remaining portions are in good condition. Artifact density is low, estimated at less than 1/sq. m in the central part of the site, and less than 1/10 sq. m at the edges.

Items at this site include flakes, choppers, and one scraper. With the exception of one flake (a large blade of local "fingerprint" chert), the assemblage was made from graywacke pebbles. The 2 choppers are unifacially flaked with use-damage and sheen present. The scraper is a trimmed sequence flake of a type common to the area in Texas (Epstein 1963). The choppers seem to be an important artifact (Gunn and Wier 1976:33) in the assemblage, but their function is not known.

LA 33109

This site measures 200 x 100 m; it is located in a saddle and on one of the adjacent hills. The site is just out of (and overlooks) the broad swale connecting the Hondo and Rocky Arroyo. Finds included two workshop areas, a thin scatter of burned rocks, and stone ring which is probably the tepee ring reported in the environmental study (EIS 1973) (Figure 8).

The first workshop was found in the saddle. It consists of an extensively flaked graywacke cobble ore, and flake fragments from that core scattered nearby. All flakes apparently had unprepared cortex platforms and selective removal of some flakes seems to have occurred.

The second workshop, near the stone ring, was all of local mottled brown or "fingerprint" chert: 5 cores, 4 biface preforms, and about a dozen flakes were seen. The biface platforms were fully edged and about 3.5 cm long with no thinning flakes removed. Two small, initial-stage biface thinning flakes from similar preforms was found; this indicates that similar items had been flaked here. The cores had cortex platforms and were not heavily flaked. Eight flakes were cortical or secondary with cortex platforms.

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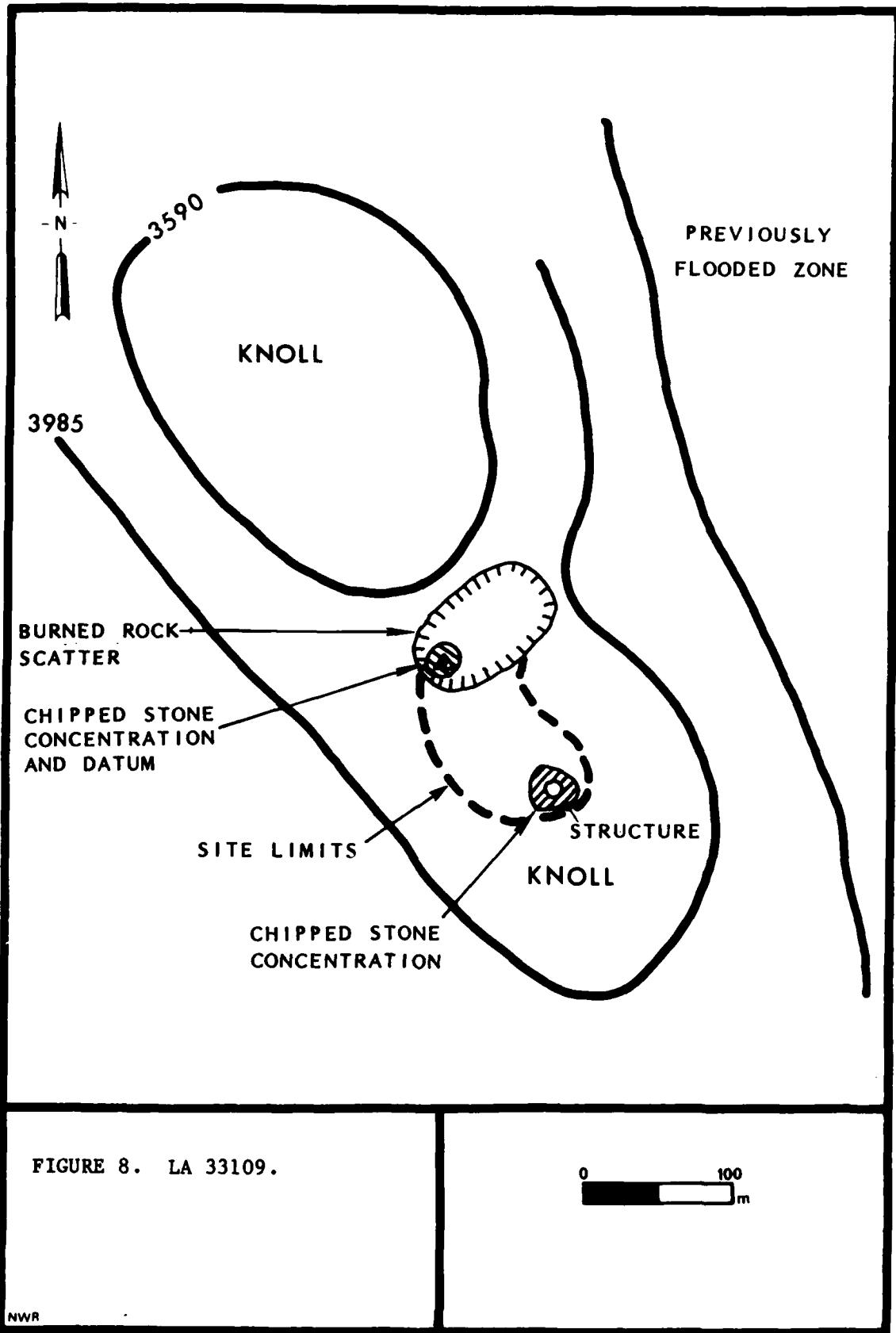
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The balance of the site assemblage included a chert hammerstone, several graywacke cobble choppers, a graywacke flake chopper, a biface core of orange patinating local chert, and scattered flakes. Many flakes exhibited gross edge damage suggestive of use as tools (Gould et al. 1971). All the flakes are large with heavy platforms, which indicates hand hammer flaking (Crabtree 1972:11).

This site contains at least two lithic technologies. For all items made from stream cobbles, all stages of use (Collins 1975) except initial procurement are evident. All chert cores and flakes are from the final stages of flake tool blank production, use and discard with some items removed for use elsewhere.

The stone ring has an internal diameter of about 2 m (Figure 9). If indeed a tepee, it would most likely be from the early historic period.

#### LA 33110

LA 33110 appears to be the remnants of a line shack or home-steader's shack (Figure 10). It is located at the base of a low hill, just inside the area already flooded. A number of large limestone rocks, possibly foundation remnants, are scattered randomly in a 10 x 10 m area. Two pieces of a cast iron washstand or stove are also present. It appears that the structure was robbed for materials. Some cut wood is present, but because the site is at the present driftwood line for the reservoir, it may have floated away in. The area is also coated with a thin layer of flotsam, and some remains may be hidden under this. Heavy disturbance vegetation has also tended to obscure the remains. In short, flooding has affected the interpretive value of this site.

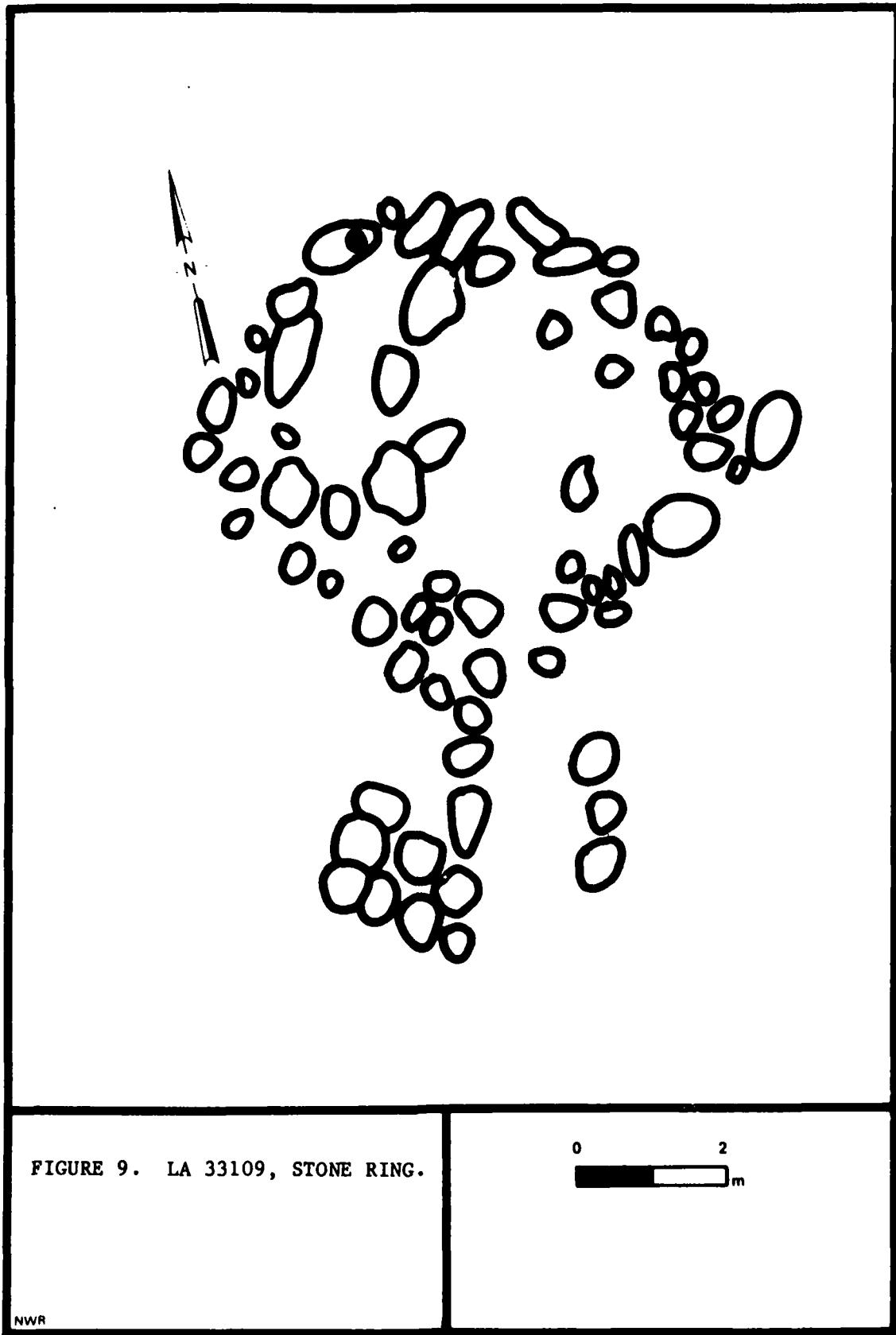
#### LA 33111

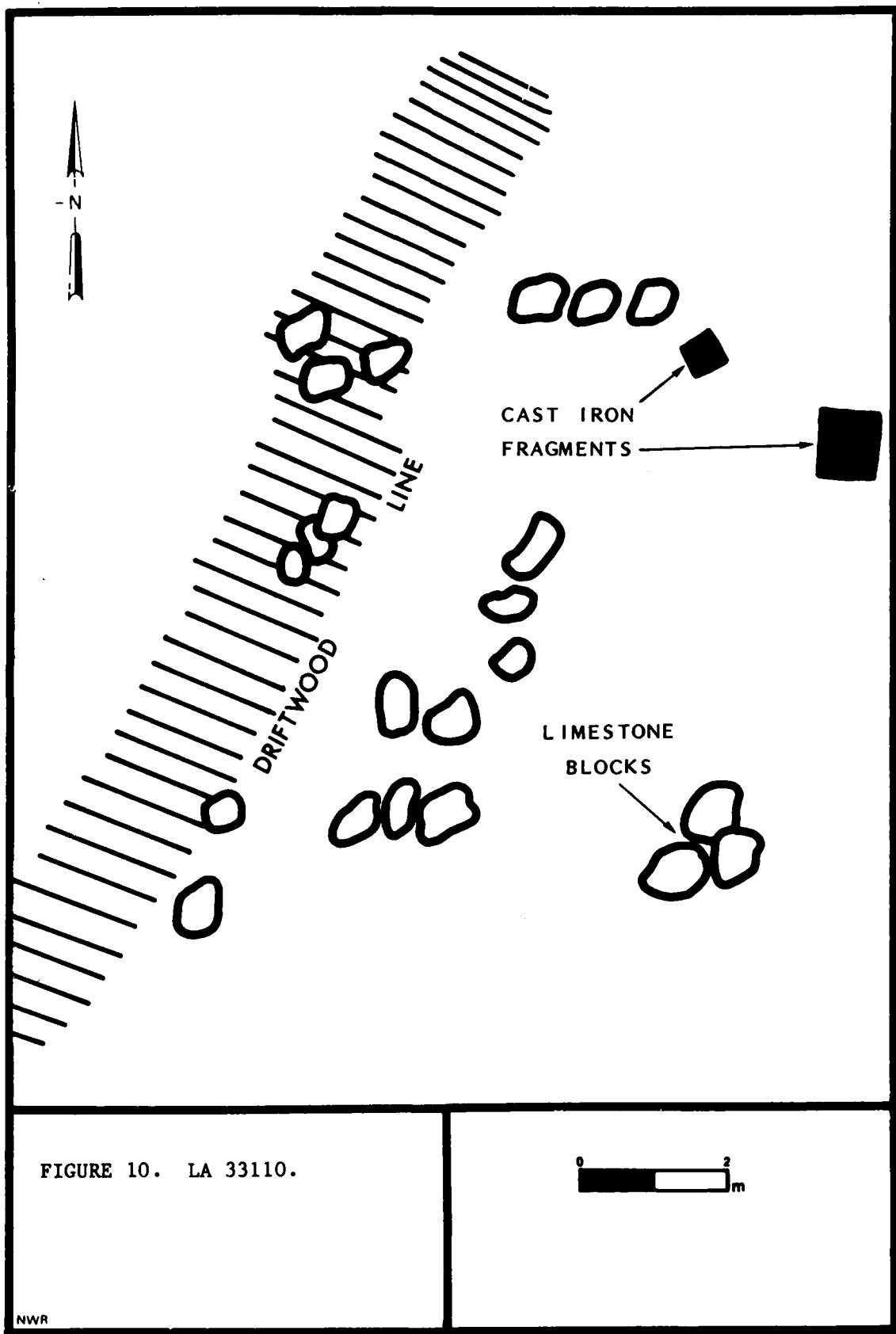
The total extent of this hilltop site is 20 x 10 m, but most items were found in a concentration 8 m in diameter. A gravel road and a powerline pass near the site, but this site does not appear to have been disturbed.

Only nine items were found. One is a unknown biface edge trim flake (Bandy 1976:92) of dark brown nonlocal chert. The others are graywacke cobble fragments--4 secondary flakes (1 with a flaked edge), 1 core fragment (or chopper), and 3 cobble fragments that seem to be heat treated or burned. We suspect that these remains may represent a temporary camp, but definitive evidence is lacking.

#### LA 33112

Located on the same hilltop as LA 33111, this site measures 35 by 25 m and consists of scattered choppers and flakes. Artifact density is estimated at 1/10 sq. m. The choppers are unidirectionally flaked cobbles of greenish-colored graywacke, with gross use-wear evident on





the bits. The flakes are secondary, of both chert and graywacke (from chopper making?). Site function is unknown.

LA 33113

A 2 by 1.5 m limestone rock circle (Figure 11) was found on a hilltop overlooking the swale between the Hondo and Rocky arroyo. Most likely it is a hunting blind; it commands an excellent view of the swale. A single basalt scraper was found 7 m SSW of the circle.

LA 33114

LA 33114 is located on a gentle hillslope near the same swale. It is a core and flake scatter; some flakes are partly buried, so the site may be about 5 cm deep. Two fragments of bifacially flaked cores, 2 large secondary flakes, and 5 flake fragments were noted. Core scars are from large primary and secondary flakes which were not found; these were probably removed for use elsewhere. Flaking was apparently by direct hard hammer percussion. Chert occurs naturally in the area, so this site was probably used for lithic procurement as well as initial reduction. The site measures 3 m by 2 m.

LA 33115

This site covers a hill whose slopes contain rich outcroppings of small nodules of chert. Although the site is large, 350 x 325 m, the density of cultural material is low compared to that of naturally occurring chert. Transects through one concentration yielded nearly 400 natural chert fragments in 12 1-m squares, but only 9 artifacts (2 cores, 2 cortical flakes, 1 secondary flake, and 4 interior flakes). Elsewhere, average artifact density on the hillslopes was estimated at 1/5 sq. m. No chert outcrops occur on the hilltop; there, average artifact density is less than 1/100 sq. m. (on rare occasion, it seems, pieces of chert were taken to the hilltop for flaking).

On the site in general, only cores and flakes were noted. The cores were typically flaked lightly (3-4 flakes), using cortex or simple flake scar platforms. Flake types were cortical, secondary, and small interior. Only local cherts were seen (several varieties are present), except for two secondary quartzite flakes that are probably hammerstone spalls. The assemblage is clearly from lithic procurement and simple flake core reduction.

LA 33116

Located along the edge of a borrow pit, LA 33116 may largely be mechanically redeposited or disturbed material. The site measures 300 by 25 m, but estimated density of remains is quite low.

A hearth (over 200 rocks in a 2 m diameter area) denotes the center of the site; to the north and south of it, burned rock is scat-

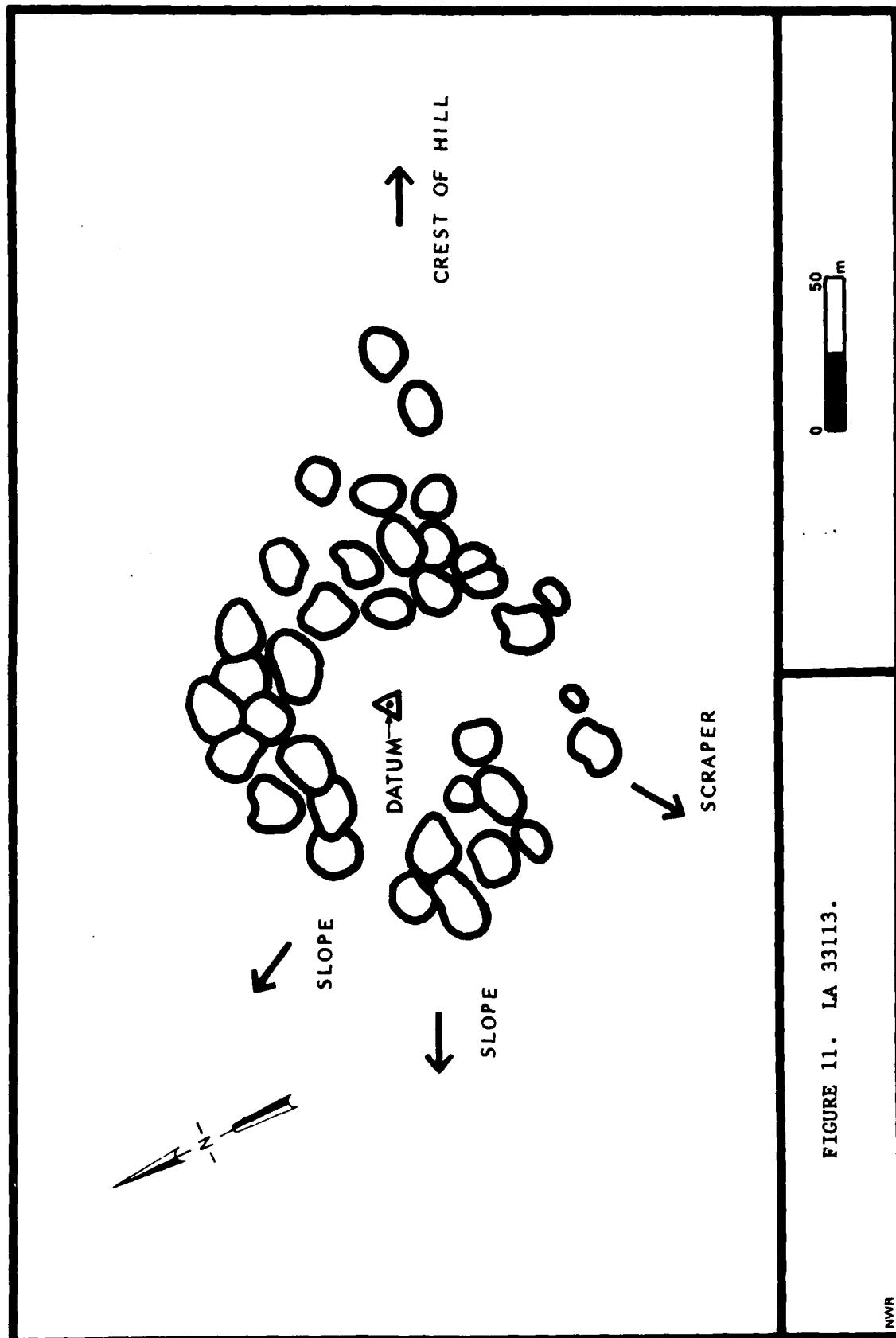


FIGURE 11. LA 33113.

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tered lightly (being less common as one moves away from the hearth). A hammerstone, 2 choppers, 3 quartzite mano fragments, and 10 flakes (mostly interior) were seen. The remains suggest use as a campsite, but original site size or intensity of use cannot be determined.

LA 33117

LA 33117 is on a low terrace remnant in Rocky Arroyo. It covers 125 by 100 m, but overall density is less than 1 artifact per 100 sq. m. Items noted were made from graywacke pebbles and include a bifacial chopper, 2 unifacially flaked choppers, a core fragment, a mano fragment, a few secondary flakes, and a few pieces of burned rock. The choppers have a pointed chopping edge, which distinguishes them from the choppers at the other sites. The site appears to be some kind of temporary habitation site.

LA 33118

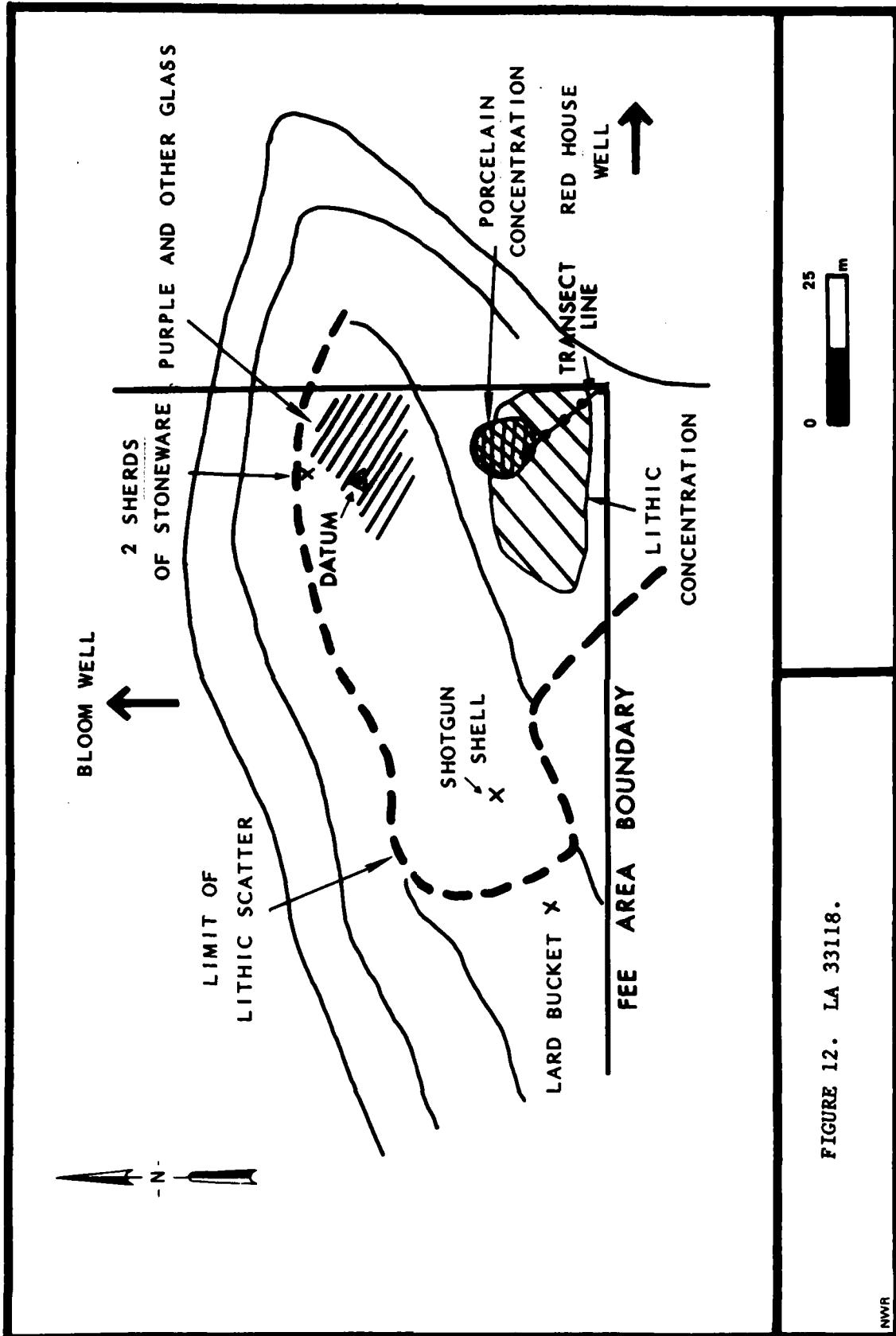
This site measures 100 by 50 m and covers the top and side of a small ridge just out of the Rocky valley bottom. The site contains two components--aboriginal and early Anglo--and extends out of the survey area (Figure 12).

The first component is a lithic procurement/reduction site. Chert outcroppings occur on the ridge slopes, especially on the southern slope, and scattered among the natural fragments is chipping debris. Core shapes are varied; both simple and prepared platforms were used. The vast majority of the cores were clearly for producing large, simple flakes. The flakes themselves are mostly cortical and secondary; blades, sequence, interior, and irregular core trimming flakes were also seen. Most interior flakes were small fragments. No biface trimming flakes were noted.

A transect through the area of greatest lithic concentration yielded 8 cores, 3 cortical flakes, 2 secondary flakes, 4 interior flakes, and 37 natural pieces of chert in 4 1-m squares (5 m apart). Chipped stone extends up onto the ridgeline, but at lower densities (less than 1/10 sq. m.). Apparently, pieces of chert were sometimes carried upslope for chipping.

All items are of the locally outcropping chert, except for one quartzite hammerstone fragment. This chert includes all varieties noted in the study area.

The historic component represents minor activities associated with Bloom and Red House Wells; this component, too, extends off the survey area. On top of the small ridge, scattered remains include a lard bucket with holes punched through the bottom (a strainer?); a shotgun shell ("No. 12/US/AJAX"); 2 sherds of stoneware; and fragments of at least 7 bottles (brown, green, and purple) made in 3-piece molds. (One base was marked "AB" with the letters joined.) Nearby, on the same hillslope as the lithic concentration, a concentration of por-



celain was found. This included about 20 fragments of a Hall China tea saucer (white core and glaze; green transfer design), and one small sherd with a cream core and blue-on-white design.

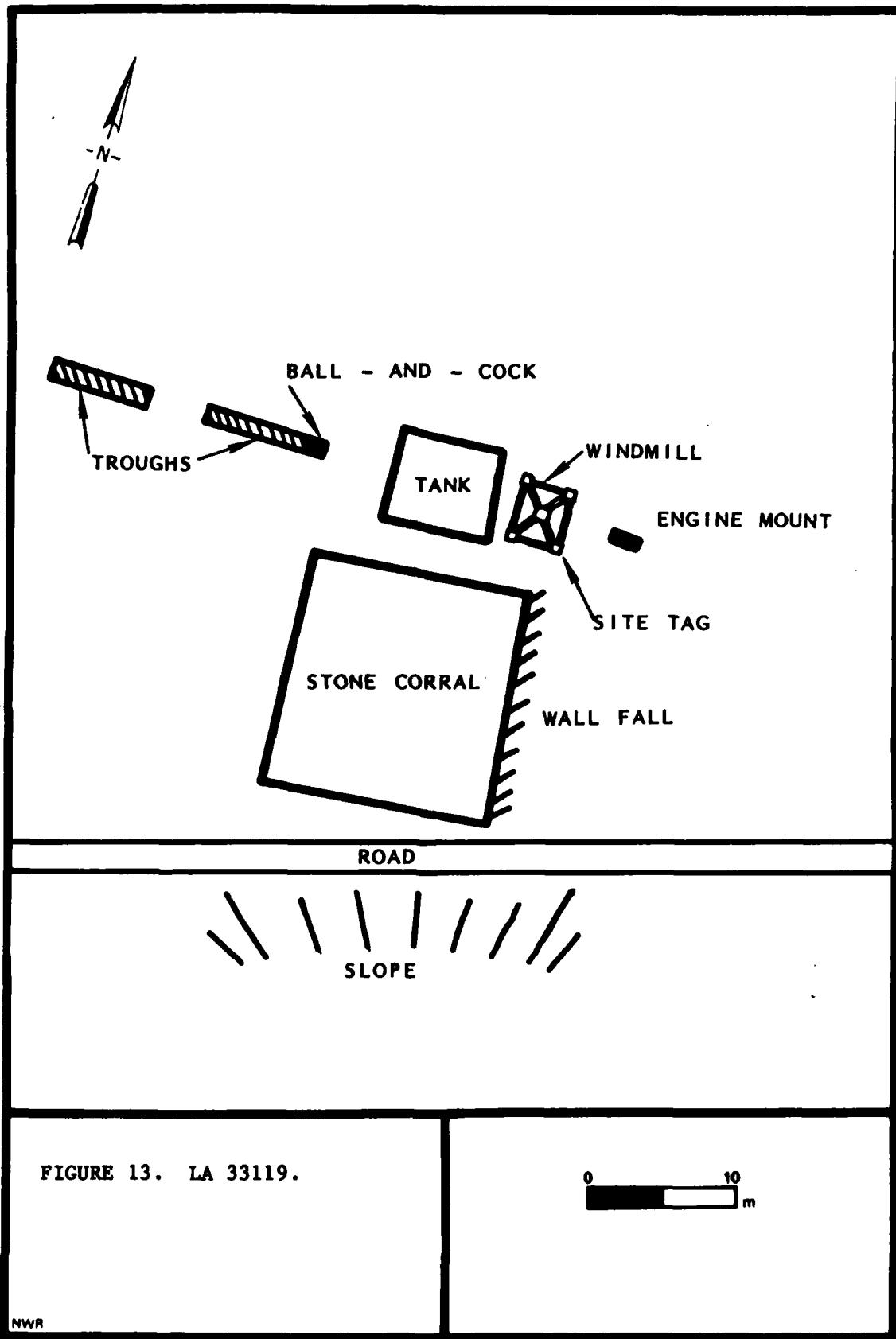
LA 33119

LA 33119 is Bloom Well (Plate 6; Figure 13), part of a historic livestock corral and watering complex in Rocky Arroyo (LA 33118 and Red House Well [off the survey area] are also part of this complex). The site measures 60 by 40 m. It includes a wooden windmill frame built with bolts and wire framing nails; a 3 by 5 foot (0.9 by 1.5 m) concrete engine mount; an 18 by 22 foot (5.5 by 6.7 m) reinforced-concrete tank made with a limestone rock base and twisted square rebar; the foundations of a 38 foot square (11.6 by 11.6 m) stone corral; and two reinforced concrete troughs, one 28 feet (8.5 m) long and the other 34 feet (10.4 m) long. The trough nearer the water tank has a homemade ball-and-cock at one end, a simple but effective device for metering water from the tank.



PLATE 6. LA 33119 (Bloom Well). ROCKY ARROYO AND BORROW PIT IN BACKGROUND.

The Bloom Cattle Co. operated in this area in the 1890s; perhaps the well was first used at this time. The generous use of exotic construction materials (rebar and concrete) show that the present structure postdates the local arrival of railroads in 1894 (see Jenkins and Schroeder 1974:65). Difficulty of transport from the



railhead, as well as the engine mount, suggest an even later construction date, most likely in the early 20th century.

LA 33120

This site is located on the flanks of a low ridge rising from Rocky Arroyo; it covers 100 by 25 m and extends for an unknown distance beyond the survey area boundary. The ridge flanks contain a dense outcropping of natural chert, with estimated densities of up to 100/sq. m. The chert is of a variety of colors but dark brown, dark olive green, and gold hues are common.

Cultural remains make up an estimated 0-50% of the chert at any spot; these include simple cores and flakes. The latter are occasionally quite large and are rarely interior flakes. LA 33120 is clearly a lithic procurement and initial reduction site.

LA 33121

This site measures 100 by 20 m and extends for an unknown distance beyond the study area boundary. It is located on a "bench" on the side of a ridge south of Rocky Arroyo. Nodules of chert occur naturally on the bench, with an estimated density of 1/sq. m to 1/10 sq. m; artifacts include 4 small cores (with 1-4 flakes removed) and small flakes at a density of less than 1/10 sq. m. Lithic procurement and initial reduction are indicated.

In addition, 2 large limestone rocks, each with a short piece of barbed wire twisted around it, were found on the site. Function of these items is unknown; they could have served as guy-wires for a tent.

LA 33122

LA 33122 is adjacent to and very much like LA 33120. It is located on a ridge which rises out of Rocky Arroyo and measures 300 by 150 m. The lower flanks of the ridge contain a rich outcropping of chert; estimated density of natural pieces of chert is sometimes over 100/sq. m. (However, many such pieces are too small to work.) The assemblage matches that at LA 33120--simple cores and cortical and secondary flakes. Ratio of cultural to natural pieces of chert is low--about 1:100.

Artifact density is much higher on the southern flank of the ridge than on its northern flank or crest. The northern flank is rather steep, even for lithic procurement. No chert outcrops occur on the upper part of the ridge; the few items found there seem to represent the occasional removal of nodules to higher spots, in order to provide a chipping station with a view.

LA 33123

A lithic scatter was found on a slightly sloping bench just off a hilltop north of Rocky Arroyo; the location has a good view of the floodplain. The site is a lithic scatter measuring 40 by 40 m. Artifact density is estimated to be 1-2/sq. m near the datum, falling off quickly to less than 1/10 sq. m over the rest of the site. Material used is all local chert; it is mostly a cream and brown banded variety (with wide, irregular bands) not found on other sites. Cores are simple and lightly flaked. Flakes are mostly cortical and secondary, with cortex platforms. The site was apparently used for lithic procurement and initial processing.

LA 33124

This site is the richest lithic procurement sited found during the survey; it follows chert outcrops along the base of a ridge south of Rocky Arroyo, and measures 550 by 200 m. This seems to be the same chert-rich stratum that outcrops at LA 33115, 33118, 33120, and 33122. (Careful geological mapping might allow prediction of other such procurement sites, based on where the layer is exposed.)

Along the lower slope of the ridge, natural pieces of chert often exceed 100/sq. m in estimated density, but chipped stone is only occasionally denser than 1/sq. m. Cores and cortical flakes predominate, and almost all the material is related to procurement and initial reduction of stone. A handful of exceptions seemed to be partly manufactured tools. A few pieces of chert have washed from the lower slopes of the ridge out into the adjacent drainage, but density in this latter area is extremely low.

The site was clearly used for extensive lithic procurement and initial reduction, with additional stages of manufacture on rare occasions. Conservatively, this site contains over 100,000 pieces of chipped stone; it is likely that the outcrops served more than the immediate population.

LA 33125

Located on a high ridgetop just south of Rocky Arroyo, LA 33125 affords an excellent view of that valley. The finds, scattered over a 75 by 20 m area, include initial flaking items (simple cores, cortical flakes, and secondary flakes), but also a biface core, a thinned biface core, interior flakes, and a possible burned rock. Estimated density ranges from 1 item/sq. m on top of the ridge to about 1/10 sq. m. along the ridgeline south of the top.

Disturbance at the site includes a recent survey monument and small construction-related hole (about 1 m across); these have caused little damage. Site function is uncertain, but use as a temporary campsite is likely.

LA 33126

A bulldozer cut runs across the northeastern part of this lithic scatter. Measuring 25 by 25 m, it sits in a saddle between 2 hills which flank the southern edge of Rocky Arroyo. Estimated artifact density is less than 1/sq. m. Nodules of chert were apparently brought up from outcroppings from the lower slope of the ridge (LA 33122) and chipped in this saddle. Small simple cores, primary and secondary flakes, and a bifacial chert "chopper" were the finds at this lithic reduction site.

Isolated Finds

These items are summarized in Table 5. In general, the isolated remains are similar to those at sites. One find, IF-24, is a pair of abutments from a bridge across the former channel of the Hondo (Plate 7). It could either be Hispanic or Anglo; precise dating of the bridge might aid in dating the channel.



PLATE 7. IF-24. (Size of tree growing through abutment indicates great age of the bridge. Scale not to north.)

TABLE 5. ISOLATED FINDS

<u>Isolated Find No.</u>	<u>Topographic Setting</u>	<u>Artifact Description</u>
1	Upper hill slope	Side scraper made on cortical flake of local chert.
2	Upper hill slope	Secondary flake of gray wacke.
3	Lower hill slope	Chopper/hammerstone, unidirectionally flaked; made on stream smoothed gray wacke pebble.
4	Lower hill slope	Biface core fragment made from fingerprint chert.
5	Upper hill slope	Chopper, bifacially flaked local chert.
6	Upper hill slope	Secondary flake of local chert.
7	Hill slope	Core fragment of local chert; has a notched edge.
8	Hill slope	Biface core; edged, relatively symmetrical, perhaps destined for thinning.
9	Lower hill slope	Bifacially flaked (denticulate) flake of gray wacke, possibly a saw; secondary flake of local brown mottled chert (local).
10	Ridge top	End scraper with notch; double notched flake; both secondary flakes of local chert.
11	Valley bottom	Thick biface (manufacturing failure) multiple hinge terminations representing unsuccessful attempts of bifacial thinning.
12	Hill slope	Interior flake of local orange mottled chert.

TABLE 5. ISOLATED FINDS (continued)

<u>Isolated Find No.</u>	<u>Topographic Setting</u>	<u>Artifact Description</u>
13	Small rise in saddle or pass	Clear Fork Gouge, unifacially truncated biface of local orange patinating chert; broken bottle (purple glass) made with three piece mold.
14	Saddle slope	Clear Fork Gouge, unifacially truncated biface of local orange patinating chert.
15	Hill top with valley view	Alternately beveled scraper made from rough textured local gray chert interior flake of local chert.
16	Hill slope	Irregular biface, roughly ovate in shape made from local orange patinating chert.
17	Hill slope	Chopper made on limestone cobble, unifacially flaked.
18	Lower hill slope	Irregular biface (preform?) of local chert.
19	Lower hill slope	Secondary gray wacke flake with trimmed or used damaged edge; biface edge trimming flake (interior) of local mottled gray chert; also purple glass bottle and soldered hole-in-top of can.
20	Upper hill slope	Dart point; medial fragment with slight barb.
21	Upper hill slope	Bifacially trimmed flake of local chert.

TABLE 5. ISOLATED FINDS (continued)

<u>Isolated Find No.</u>	<u>Topographic Setting</u>	<u>Artifact Description</u>
23	Lower hill slope	Interior flake with limited unifacial trimming; heat treated (local?) chert.
24	Valley bottom	Limestone faced, earth-filled abutments for small bridge (early European). Overall original dimensions about 50 x 4 m by 1 m high, with a span (now gone) about 7 m.
25	Hill slope	Double-end scraper with multiple notches, made from purple quartzite.
26	Lower hill slope	Light scatter of burned rock in 8 x 5 m area.
27	Lower hill slope	Small complex core; local chert.
28	Lower hill slope	Spoke shave (concave side scraper) on primary flake of banded chert.
29	Lower hill slope	Interior flake (marginally trimmed) of orange patinating chert.
30	Hill slope	Burned rock concentrations, including fragments of a metale.
31	Lower hill slope	Hearth and burned rock scatter (disturbed).
32	Hill top	Interior flake with bifacial trimming, made from local brown mottled chert.
33	Lower hill slope	Secondary blade of finger-print chert.

TABLE 5. ISOLATED FINDS (continued)

<u>Isolated Find No.</u>	<u>Topographic Setting</u>	<u>Artifact Description</u>
34	Lower hill slope	Polyhedral core of local brown mottled chert.
35	Hill top	Projectile point medial fragment and primary flake fragment with unifacial trimming.
36	Hill top	Thick biface (preform) of fingerprint chert and core fragments of orange patinating chert.
37	Saddle	Burned rock concentration (hearth?) within 12 x 7 m burned rock scatter.
38	Hill slope	Irregular thick biface (preform?) of local chert.
39	Ridge top	Primary flake of local orange mottled chert and interior flake of fingerprint chert with highly prepared platform remnant and edge flaking.
40	Saddle	Scraper on interior flake of local chert with multifaceted platform remnant.
41	Hill slope	Interior flake of fingerprint chert with multifaceted platform.
42	Saddle slope	Chopper, unifacially flaked stream smoothed pebble of graywacke; has a well-developed use-sheen.
43	Hill slope	Chopper, unifacially flaked edges in three edges of graywacke pebble; extensive use-damage and use-sheen.

TABLE 5. ISOLATED FINDS (continued)

<u>Isolated Find No.</u>	<u>Topographic Setting</u>	<u>Artifact Description</u>
44	Saddle	Trimmed flake fragment of cream-colored local chert.
45	Upper hill slope	Side scraper on secondary flake of local chert.
46	Valley bottom	Purple glass sherd.
47	Lower hill slope	Double side scraper made on blade of Alibates flint; cortex flake of banded chert; secondary fragment of orange patinating chert.
48	Valley bottom	Ceramic (glazed porcelain) sherd with remnant of molded pattern.
49	Low rise	Cortical flake of finger-print chert.
50	Valley bottom	Rock alignment (historic structure remnant?) 6 m x 0.5 m.
51	Valley bottom	Burned rock scatter with cortical flake and biface core, both local chert. both local chert.
52	Valley bottom	Barrel loop.
53	Valley bottom	Bottle neck fragment.
54	Valley bottom	Base of Menthelatum jar.
55	Saddle	Secondary flake of local creme chert.
56	Bedrock bench on upper hill slope	Thin ovate biface of orange mottled local chert.
57	Lower hill slope	Small polyhedral core of local chert producing flakes < 2 cm in length and with cortex striking platform.

## CHAPTER 7 INTERPRETATIONS

The research design in Chapter 4 was intended to apply to a greater area than the immediate vicinity of the Two Rivers Dam, and a thorough evaluation of its usefulness would require data from a larger area than actually surveyed. Nonetheless, it is possible to offer some criticisms and evaluations of the research design which, we hope, will be instructive to future workers. In addition to comments based on survey results, it is possible to note criticisms of the research design on more purely logical grounds.

### Critique of the Research Design

Perhaps the greatest problem with the research design was the lack of formal criteria by which a site could be classified functionally. As a result, the functional assignments in Table 6 remain somewhat intuitive. It is possible to note factors which were used to assign functions to sites, but the model would be greatly strengthened if more formal, a priori criteria were developed prior to any future use.

The most difficult task in this sense was in distinguishing single-activity (or 'opportunistic activity') loci from multiple-activity ones. Ideally, the distinction would correspond to that between isolated finds and sites. In fact, the analytical category of 'isoalted find' does seem to represent single activities, in almost all cases; but as became apparent during survey, many 'sites' were probably the result of single, limited activities. In Table 6, sites which seem to represent a single chipping episode or other highly limited activity are classed as opportunistic activity sites.

More specific functional identifications (for example, lithic procurement/processing sites, or habitation sites) were based on the remains specified for each category in Chapter 4. Still, these descriptions were limited and qualitative, and so depended in part in intuitive judgements in the field. For example, remains from lithic procurement/initial reduction sites were stated to include "cortical flakes, cores and other discarded material from testing and initial reduction of local stone." While valid in itself, this criteron would be improved if it were more detailed and if some statement of relative frequencies of given items were hazarded.

An additional concern is that of cultural and chronological affiliation, discussed at the start of Chapter 4 but only partly developed thereafter. While predictions on site location are made for each of the traditions which occurred in the region, no specific criteria for identifying specific traditions was provided. While a knowledge of diagnostic remains is a part of the armamentum of Southwest archaeologists, a statement of likely diagnostic items (and criteria or

references for identification) would have made the process more explicit. We may note that in practice, few diagnostic remains were encountered, making it difficult to evaluate predictions about changing adaptive patterns through time. The research design was fortunately prepared with this possibility in mind, and it is possible to test the predicted correlations between function and location in an atemporal sense (see Table 2 in Chapter 4).

### Survey Findings

Keeping in mind the caveats just offered, we can turn to the summary in Table 6 and also consider the results in Table 5. To begin with, it appears that most sites fall into three categories: opportunistic activity loci, recurrent-use lithic procurement sites, and habitation sites.

It does appear that (as predicted) opportunistic activity loci occur throughout the landscape. They are common on floodplains, but this probably has more to do with silting and mechanical disturbance in those areas than with prehistoric behavior. Many of the opportunistic activity loci (whether classed as isolated finds or as sites) are related to lithic procurement and initial reduction, and so they are located in relation to lithic resources rather than to other factors such as topography. Recurrent use lithic procurement sites show a similar distribution, undoubtedly for the same reasons. It is doubtful that later models will be able to predict the location of lithic procurement sites with any precision until sources of chippable stone are known. One possibility for future research would be to identify which geologic strata in the region contain cherts, and to trace exposures of the strata from geological maps or similar studies.

Two aspects of lithic procurement sites deserve special note. First, there is the sheer amount of the remains. Clearly, far more chipped stone was produced than was needed for local consumption; either an extensive trade in the stone was taking place, or outside groups were visiting the "quarries". At least one of the local cherts, the striped or "fingerprint" variety, has been found in sites in other parts of the Middle Pecos Valley (J. Speth, 1981, personal communication). The procurement, movement, and use of Two Rivers cherts is a promising topic for future research on a regional level.

Second, there is the considerable variation in size and content of such procurement sites. To some degree this must reflect the extent of chert outcrops and the size and quality of chert nodules. However, other factors (such as changing cultural, social, or adaptive context) probably also played a role in the variability we observed. Explaining this variability is another issue for future research; it is a factor which the research design only begins to address.

The remaining few sites of "known" function include a hunting blind, a lithic workshop, historic remains, and 10 aboriginal

habitation sites. None of these is on a hillslope (as generally was predicted), but two were on hilltops when this was not a predicted location. It appears that the formal model underestimated the importance of actual hill and ridge crests as locations for recurrent activities. The strongest trend of all, however, occurred with habitation sites - 8 of 10 occurred either on or next to the Hondo and Rocky Arroyo floodplains (that is, in valley bottoms). While sites have long been known to occur in the bottom of the lower Hondo Valley (e.g., Wolfe 1931), the particular tendency of habitation sites to be found there (and not elsewhere) has been less obvious. This tendency, then, represents a minor refinement to the rule of thumb that sites in the region are to be expected in the bottoms of valleys.

With the limits of model and data, more precise (or quantitative) evaluations of locational predictions do not seem called for. Hopefully, future work in the area will be able to derive probability statements on site distributions rather than just statements of possible locations. For now, we can note that survey of about 1900 acres yielded 36 sites and 57 isolated finds, or an average density of 20 finds per square mile. From this it would at least seem that in this region, sites (whether in valleys or in upland terrain) are denser near major streams than at some distance from them (cf. Camilli 1980).

When it comes to chronological and cultural affiliations, interpretations are also limited. No Paleo-Indian remains were found, but this is not surprising; conditions for preservation and subsequent exposure of such remains are largely absent. The lack of pottery at most sites indicates that the major occupation took place during Archaic times. Of course, lithic procurement sites (especially smaller ones) are unlikely to have diagnostic remains if they were being visited from campsites elsewhere. Still, other site types, including habitation site, lack pottery, and limited numbers of diagnostic Archaic period artifacts were found.

Several presumed Archaic habitation sites occur; this may reflect a shifting of campsites over several centuries. The variability in the habitation sites (a possible single-use site at LA 33117, a multiple-use site at LA 33106, and a large base camp at LA 33100, for example) suggests that the nature of the Archaic occupation was more varied than expected. We suspect that towards the end of the Archaic, the large, perennial base camp, shifted slightly downstream, probably continued into the early ceramic period. Other sites with early ceramic remains are lacking.

The absence of late ceramic remains is puzzling, given the presence of such remains both upstream and downstream on the Hondo. Perhaps at this time a clustering effect was occurring, and the study area happened to be in an intervening zone between sites.

Evidence for historic remains is limited as well. One site with a small tepee ring was found. The only remain possibly from the

Hispanic-American period is IF-24, a bridge, but this may actually date later. Remains from the early Anglo period are meager, considering the importance of the Hondo as an area for driving and raising cattle. Part of the lack of early Anglo remains may relate to the area's use as open range; under those circumstances there is little incentive for individual ranchers to put in structures or other permanent improvements. The most prominent Anglo site is Bloom Well, a windmill, tank, and trough complex, which postdates the open-range era.

TABLE 6. SUMMARY OF SITE VARIABLES

LA Number	Size (m)	Chipped Stone	Ground Stone	Pottery	Burned Rock	Historic Remains	Architec-ture	Tentative Affiliation	Setting	Tentative Function	Located Predicted
33091	35 x 30	X						?	4	2a	yes
33092	15 x 15	X						?	2	2 (1 or 2a)	maybe
33093	4 x 2	X						?	5	1a	yes
33094	4 x 3	X						?	5	2b	no
33095	12 x 3	X						?	5	?	---
33096	2 x 2	X						?	3	1c	yes
33097	2 x 2	X						?	3	1c(?)	maybe
33098	80 x 40	X			X			?	2	3(?)	maybe
33099	25 x 10	X	X					Archaic	2	3a(?)	maybe
33100	800 x 500	X			X			Archaic	1	3c	yes
33101	5 x 5	X						?	3	1c	yes
33102	190 x 60	X		X				Later Ceramic	2	1a(?)	maybe
33103	240 x 40	X		X	X			Early Ceramic(?)	1	3	maybe
33104	850 x 550	X	X	X	X			Early Ceramic	1	3c	yes
33105	60 x 40	X			X			?	2	1b(?)	maybe
33106	850 x 150	X			X			?	5	3b	no
33107	60 x 15	X			X			?	1	3	yes
33108	80 x 40	X						?	5	?	---
33109	200 x 100	X				X	X	Historic Indian	2	1a	yes
33110	10 x 10	X				X	X	Anglo	2	N/A	N/A
33111	20 x 10	X						?	5	1d(?)	maybe
33112	35 x 25	X						?	5	?	---
33113	2 x 2	X					X	?	5	2d	yes
33114	3 x 2	X						?	3	1c	yes
33115	350 x 325	X	X					?	2,3,5	2a	yes
33116	300 x 25	X	X		X			?	2	3	maybe
33117	125 x 100	X	X		X			?	2	3a(?)	maybe
33118	100 x 50	X				X		? / Anglo	3,4	2a <sup>1</sup>	yes <sup>1</sup>
33119	60 x 40					X	X	Anglo	2	N/A	N/A
33120	100 x 25	X						?	3	2a	yes
33121	100 x 20	X				X		?	4	2a <sup>1</sup>	yes <sup>1</sup>
33122	300 x 150	X						?	2,3,5	2a	yes
33123	40 x 40	X						?	4	2a	yes
33124	550 x 200	X						?	3	2a	yes
33125	75 x 20	X			?			?	5	3a(?)	maybe
33126	25 x 25	X						?	4	2b	yes

<sup>1</sup> Aboriginal component

### Paleo-Environment: Tentative Inferences

Although the present study is archaeological in nature, concern with paleo-environmental change led us to make notes on local geomorphology. We offer the following observations as tentative ones, which we hope will inspire more thorough studies. The reader is warned that the following comments, based on limited observations, are to be taken as preliminary suggestions.

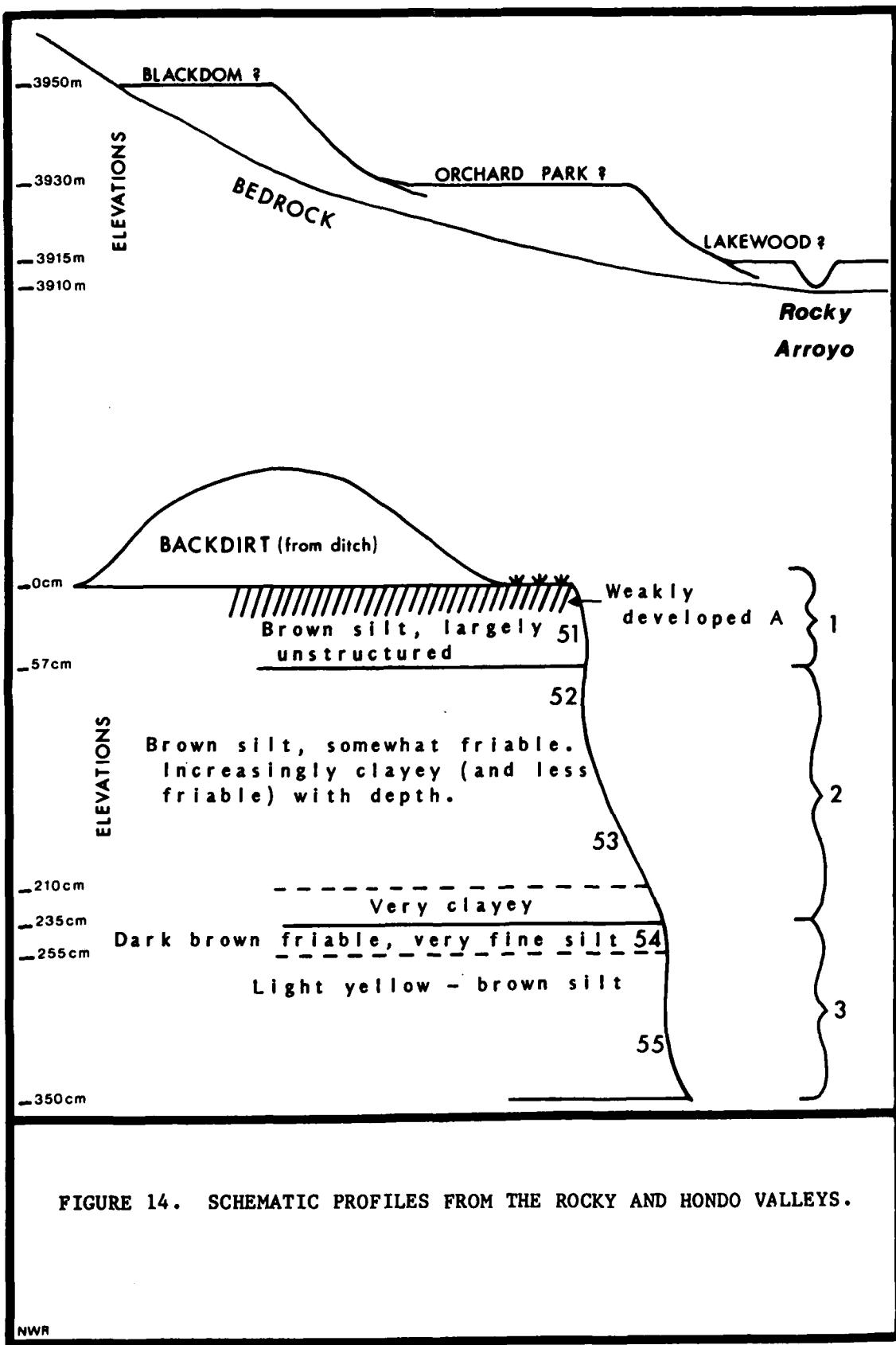
The baseline for the present work is Fiedler and Nye's (1933) Pecos Valley terrace sequence, with emendations by Jelinek (1967). The sequence, from oldest to youngest, is:

- 1) Blackdom: cemented conglomerates and sandstones, 30-50 feet (9-15 m) above the next younger terrace; of Pleistocene age.
- 2) Orchard Park: loose to poorly consolidated sands and gravels, 5-10 feet (1.5-3 m) above the next younger terrace; also of Pleistocene age.
- 3) Lakewood: unconsolidated silts, sands, and gravels, 10-30 feet (3-15 m) above the bottom of the present river channel. This is Holocene; Henderson (1976:7) notes that ceramic sites are found on this terrace but preceramic ones are not. From this he infers that the deposits are post-Archaic. More likely, the Lakewood deposits were an active floodplain in Archaic times; sites there have been buried or destroyed, while those on the older and higher deposits have survived.

### Local Deposits

Along Rocky Arroyo, terrace remnants are present which seem to correspond to the main valley sequence (Figure 14a). The highest terrace (at about 3950 feet just downstream from the borrow pit) survives as small areas at the bases of hills on the valley edge. This contains silts and gravels; it may tentatively be equated with Blackdom. The next lower terrace (at roughly 3930 feet) extends about a third of the way across the valley floor from its southern edge. It also contains silts and gravels and presumably corresponds to Orchard Park. The lowest terrace (at about 3915 feet), which seems less gravelly than the other two, can be equated to Lakewood in the main Pecos Valley.

On the Rio Hondo, a different story emerges. Rather than episodes of downcutting and terrace formation, there apparently occurred successive episodes of silt deposition and soil formation (Figure 14b). In many parts of the valley bottom, the basal alluvium consists of river cobbles derived from upstream; we associate these with the last part of the Pleistocene, or Orchard Park. Superimposed on these gra-



vels (or directly on the San Andres limestone) is a series of fine calcareous silts; the sequence to be described is from a profile near the Hondo River (Plate 8; a pollen series from this profile is discussed in Appendix 3) (cf. Haynes 1968; Hodson and others 1980).



PLATE 8. SOIL PROFILE IN HONDO FLOODPLAIN. (Preparing the profile.)

The lowest unit extends from 235 to below 350 cm below present ground surface. The upper 20 cm of this is a dark brown, friable silt; below is a light yellow-brown silt which may be somewhat oxidized. This can tentatively be equated with Haynes' (1968) Unit B.

The next soil layer is rather thick, from 57 to 235 cm below present ground surface. The top of this layer is a brown silt which is blocky and somewhat friable; with depth it becomes increasingly clayey and progressively less friable, until from 210 to 235 cm it is somewhat massive. Based on limited exposures, the Archaic remains at LA 33100 appear to be at or near the top of this layer. Tentatively, the layer corresponds to Haynes' Unit D, and the break at 235 cm to Haynes' Unit C.

The top layer of soil (0 to 57 cm) is a brown, largely unstructured silt with a weakly developed "A" horizon. The early ceramic remains of LA 33104 seem to occur within this soil unit, which can be equated to Haynes' Unit E.

#### Inferences

Rocky Arroyo has probably always been characterized by variable and sometimes violent stream flow, as suggested by the gravel and silt layers in its terraces. The Hondo, in contrast, seems to have changed its nature through time. There, basal gravels suggest strong peak flows during the late Pleistocene. With that period's close, however, gentle and fairly uniform stream flow resulted in the deposition of uniform fine silts.

A break in this deposition sufficiently long to allow soil formation is suggested at 235 cm in the profile described above. If the correlation with Haynes' units is correct, this break would reflect the climatic regime of the Altithermal, which is consistent with the suggestion of greatly reduced stream flow. The corresponding event in Rocky Arroyo would be downcutting through the 3930 foot valley bottom.

Resumption of gentle, fairly permanent stream flow is indicated by the thick middle soil layer equated to Unit D. Whatever the exact level of LA 33100, pieces of freshwater shell (Unionidae, possibly Anodonta) eroding from that site clearly suggest that permanent streamflow occurred. In Rocky Arroyo, the corresponding event would be deposition of alluvium to form the 3915 foot valley bottom.

The break at 57 cm indicates a second period in which Hondo streamflow was greatly reduced; it is probably equivalent to Antevs' (1955) Whitewater drought. If LA 33100 and 33104 do, in fact, bracket this break, further study of those sites should allow highly precise dating of the break. At present, it would seem that it falls somewhere between A.D. 500 and 900 (Haynes 1968; Irwin-Williams 1979:33; Euler and others 1979).

Resumption of permanent flow for the ceramic period is indicated by the top silt level. This evidence for a permanent stream is reinforced by Speth's (1981 personal communication) finds of muskrat and other water-oriented remains in Lincoln phase deposits. (If any corresponding deposition took place in Rocky Arroyo, it was limited.)

Continuation of the live stream into the nineteenth century is indicated by 1866-1867 survey noted earlier, and by IF-24, the bridge across the old channel of the Hondo. The channel in question is so meandering that it could only have been made by a fairly constant slow stream across a high water table. Dating the bridge would help fix the point at which permanent stream flow ceased, because construction of the bridge would have been superfluous afterwards. In any case, this site supports the historical record of live stream flow in the

second half of the nineteenth century. Precise dating of LA3319 (Bloom Well) may also indicate a time after which streamwaters were not available.

A brief review of these statements should highlight important points. The Hondo was probably a live stream on a high water table for much of the last 10,000 years. As such it must have supported a rich riparian community, and a high water table may have made farming fairly easy. In short, the Hondo was a magnet for human groups. Remains from earlier occupations, however, may either be washed away or deeply buried. Finally, one period of drought - sometime between A.D. 500 and 900 - may coincide with the break between Archaic and early Formative occupations of the area. We must close this section with a final warning that the reconstruction is highly tentative; if it spurs more careful study of such data it will have served its purpose.

## CHAPTER EIGHT CONCLUSIONS AND RECOMMENDATIONS

### Summary of Archaeological Findings

Almost all sites in the study area fall into three basic categories: opportunistic activity sites, recurrent-use lithic procurement sites, and habitation sites. Habitation sites tend to occur in valley bottoms (in or adjacent to the floodplain), but also occur on hilltops. Locations of the most common sites - lithic procurement sites, either single or multiple use - are not predictable under current methods; their locations are determined by the occurrence of chert outcrops rather than by variables such as topography.

No evidence of Paleo-Indian occupation was found. The absence of pottery from many sites, as well as limited numbers of diagnostic artifacts, indicates that the major occupation of the study area took place during the Archaic. The existence of several Archaic habitation sites may be due to shifting of campsites over the centuries. We suspect that towards the end of the Archaic a large, perennial base camp existed on the Hondo floodplain. The same base camp, shifted slightly downstream, probably continued into the early ceramic period. Other sites with early ceramic remains are lacking.

Late ceramic remains are virtually absent. However, sites of that period are known to occur just downstream from the study area. Evidence for historic Indian occupation is limited to one site with a small tepee ring.

No evidence for the Hispanic-American period was found, unless IF-24, a bridge, dates to that time. Remains from the early Anglo period are meager, considering the importance of the Hondo as an area for driving and raising cattle. The most prominent Anglo site is Bloom Well, a windmill, tank, trough, and corral complex; while its status is problematic (Chapter 1), we have considered it in this report.

As part of the study, a model of site distribution (relative to site function and adaptive strategy) was devised. It proved to have weak predictive power, in part because it specifies potential locations of sites rather than providing quantitative estimates of site density or frequency by type. The data gathered during this study are not sufficient to allow full evaluation or quantification of the model, but some criticisms were made. The tendency of habitation sites to be on valley floors was just noted. It also appears that opportunistic activity loci and lithic procurement sites are the only site types to occur on hillslopes; other site types occur on more moderate terrain.

Finally, we may note that the Rio Hondo appears to have been a perennial stream through much of the area's history. The existence of a live stream - and its attendant plant and animal life - does much to explain the extent of archaeological remains in the Two Rivers area.

### National Register Recommendations

Criteria for evaluation of properties for National Register nomination are outlined in Chapter 1, Title 36 (CFR) Part 60. The criterion most cited by archaeologists (an the only one relevant to the finds at Two Rivers) is that given sites or areas "...have yielded, or are likely to yield, information important in prehistory or history". It is worth amplifying this statement with another one, made by the HCRA:

This point is often misunderstood by archaeologists... certainly all sites contain information, but the key question is whether that information is important enough to protect the site and/or the information it contains for future generations (in GAO 1981:58).

We believe that a site is "important enough" if it is likely to fill in major gaps in local or regional cultural history; is likely to provide substantial new information about a past society's technology, economy, social relations, or ideology; or could be used to test key controversies or hypotheses about human behavior or history. With this in mind, we consider the 6 sites listed below to be eligible for National Register nomination. Location, size, and other data are included elsewhere in the report, or have been submitted separately.

#### LA 33100

This site is an extensive (800 x 500 m) site which is most likely of late Archaic age. Although a portion of the site has been destroyed by a dam borrow pit, enough of it remains (and is capped by a protective layer of silt) to permit study of a variety of questions pertaining to the Archaic.

In terms of the research design proposed in Chapter 4, the basic value of this site would be in better defining the role of "base camp" in the hypothesized late Archaic pattern of central-based wandering. The first step, of course, would be to confirm the identification of this site as a base camp. To do so, it would be necessary to establish the range of activities which occurred at the site, and to contrast these activities with those at more specialized sites. It would be especially important to determine which activities were exclusive to base camps, and what time of the year such camps were used.

In addition, the known site content suggests several specific research questions worth asking. The existence of over a dozen burned-rock concentrations shows that food processing was an important site function. Normally, such concentrations are associated with the processing of leafy succulents (Shafer and Bryant 1979), but these species are absent from the Two Rivers area today. Identification of

the species being prepared is, therefore, necessary. If leafy succulents were in fact being cooked, were these from now-extinct stands or were they obtained from other areas? If they were not being used, what other foods were being prepared in these hearths? Of course, pit-roasting was not the only possible food-processing activity at the site. We can hypothesize that, as a base camp, this site should show a wide range of food-related activities.

A second point of concern is suggested by the chipped stone noted at the site. While many sites in the study area were related to procurement and initial reduction of chippable stone, LA 33100 has a predominance of interior materials. Careful study of the site's lithic assemblage should allow definition of the stages of tool manufacture, use, and discard which took place, and, thus, clarify the relationship between base camps and more specialized sites. In particular, the correspondence between specialized lithic activities at sites and specialized economic activities needs to be defined.

A third research focus is based on the existence of burned-rock clusters and of a silt covering over the site. These indicate that at least some features have been preserved, and that others - including spatial clusterings of artifacts, storage pits, or even structures - could be found. (At the Keystone Dam Site in El Paso, O'Laughlin [1980] found remains of small brush dwellings in a similarly buried Archaic site.) If present, such features would allow more careful definition than is usually possible of occupational intensity, size and nature of social units, activity spacing, and so on. These, in turn, would again help establish the role of base camps within an overall Archaic adaptive strategy.

A final specific research concern is the nature of environmental change during human occupation of the area. As noted earlier, LA 33100 is in a physical context where the site could be related to geomorphological and palynological data from the Hondo floodplain. At this point, placement of the site within the sequence in Chapter 5 is quite tentative; additional study could fix the site's age and placement more firmly, providing a precise temporal "anchor" for local study of environmental reconstruction, as in the case of the Andonta shell noted among the remains.

#### LA 33104

Except for the presence of pottery, this site is very similar to LA 33100, and may represent a continuation of occupation at the earlier site. In terms of the model in Chapter 4, it is also seen as a "base camp" within a central-based wandering strategy; the basic research question would again be to confirm the functional role assigned to this site. Given developments elsewhere in the southwest, one may also ask to what extent this early Ceramic site reflects a continuation of Archaic adaptive patterns, and why. One specific hypothesis along these lines is that horticulture was not highly important along the middle Hondo until the later ceramic period.

The individual issues raised for LA 3100 are equally relevant for this site. It appears that burned-rock hearths continued to be important during the early Formative; identification of the foods used in these hearths would go far in establishing continuity or change between Archaic and Formative adaptive strategies. The lithic industry at LA 33104 also consists heavily of interior products, again, suggesting the latter stages of tool preparation, use, and discard. Elucidation of base camp activities should consider lithic technology in light of the functions of tools being used there.

As a buried site, LA 33104 promises to yield features such as activity areas, storage pits, and possibly even structures. These, again, would allow more precise definition of activity spacing, size and nature of social units, and so on, than has been possible so far in the Middle Pecos area. Finally, as at LA 33100, the archaeological data at this site can be juxtaposed with environmental data from the Hondo floodplain. The site should be dated more exactly and related to the geomorphological features of the floodplain, in order to provide a second firm anchor (along with LA 33100) for paleo-environmental reconstructions. Such careful local reconstructions, it may be noted, are necessary for an adequate understanding of adaptive changes over time.

#### LA 33106

This site is a fairly superficial scatter of remains on a low ridge, so at first glance it would seem much less significant than the two sites just reviewed. It is important, however, because it appears to be a fairly extensive habitation site of a different type than LA 33100 or 33104. In particular, repeated but intermittent use by small groups is likely. The basic research value of this site would lie in confirming the nature of the occupation, dating the site, and contrasting the adaptive strategy behind the site to that behind the two base camps discussed above. In terms of the model in Chapter 4, a site of this type is indicative of a restricted-wandering strategy, which we associated with the early and middle Archaic. Thus, accurate dating of this site would directly test the predictive value of the model.

Because of its superficial nature, this site may note be useful for as wide a range of specific questions as was the case for LA 33100 and LA 33104. However, the burned rock at LA 33106 again raises the question of what foods were being prepared in this manner. Additionally, definition of discrete activity areas along the ridge, and functional identification of the activities in question, should be possible and would aid in establishing the range of activities at a site of this kind.

#### LA 33118

Bloom Well (LA 33118) is a good example of a corral and livestock watering complex from the early Anglo ranching (i.e. post-open range)

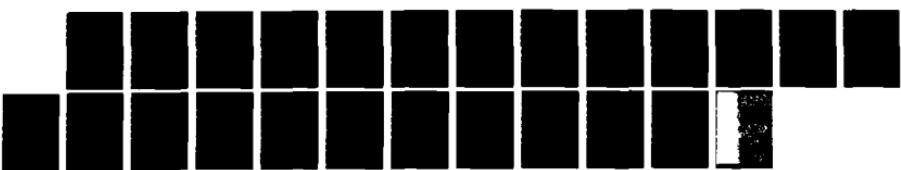
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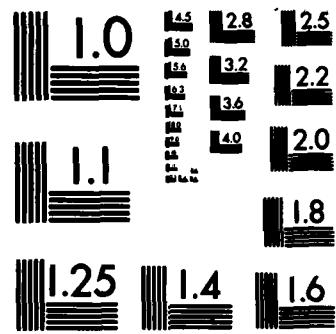
INTENSIVE SURVEY OF TWO RIVERS DAM AND RESERVOIR  
PROJECT CHAVES COUNTY NEW MEXICO(U) NEW WORLD RESEARCH  
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

period. Only the foundations of the corral remain, and the windmill's moving parts are missing, but the engine mount, mill frame, tank and troughs are in good condition. (Bloom Well is actually part of a larger series of remains, including Red House Well, but many of these are on private land.)

Bloom Well especially deserves study because it indicates the impact of mechanized transport and outside capital on Western cattle raising. The concrete and steel bar used to build this complex were not available before the railroad arrived in Roswell, and were probably beyond the financial reach of an independent small rancher. The capital-intensive nature of the complex is further underscored by the building of a large stone corral and by the use of a motor to help pump water. Detailed study of the complex (and of relevant archival sources) may allow more precise determination of site age, origin and nature of materials used, and role within the development of livestock industry in the Hondo Valley.

#### LA 33115, LA 33116

These sites are similar enough to be significant for identical reasons. Each is an extensive outcropping of chert which was used as a source of chippable stone; in each case the large number of artifacts (despite a low overall density) suggests that outcrops were used intensively over many years. The main value of the sites is in determining the nature and extent of the lithic procurement activities in this area. While much of the initial reduction of stone in this area had as its goal the procurement of simple flakes, other technical approaches (e.g. bifacial core and tool production) have been noted. The possible cultural and temporal implications of this variability are not understood, and should be elucidated.

Beyond this, however, the sheer extent of these and other procurement sites indicates that the local outcrops were not merely used to meet local needs. This raises the likelihood that peoples from the greater region were either coming to the study area to obtain chippable stone, or were obtaining partly reduced stone by trade with the local peoples. More careful identification of the initial reduction techniques used, and of varieties of local chert, would help establish the nature and extent of this procurement or exchange behavior.

#### Other Sites

To begin with, we must point out that the Hondo Reservoir is being nominated to the National Register (and also to the State Register of Historical Properties). Therefore, we recommend against any disturbance of the short segment of the reservoir intake channel on Corps land. Copies of the nominations are available through the Roswell District Office, Bureau of Land Management. (The intake channel segment on Corps land is within LA 33104.)

The majority of finds are not recommended for individual nominations to the National Register. Reasons are specified in Table 6; but, in short, these are considered too limited or disturbed to yield, on an individual basis, important information on the area's past.

#### Statement of Eligibility as a District

When taken as a whole, the Two Rivers study area is clearly eligible for nomination as a district. Besides containing several sites recommended for individual nominations, the area has a large number of smaller finds which, if studied as a whole, could answer questions in a way not possible on an individual site basis. The most pressing research need for this area is an understanding of regional adaptive/settlement strategies as a dynamic response to environmental conditions. This necessarily implies a comparative approach, both between sites within a given strategy and among sets of sites characteristic of different strategies. Such an approach simply cannot be accomplished on an individual-site basis; it implies comparisons of sites from different periods as well as contrasts between large and small sites. We are not suggesting that all finds made at Two Rivers are equally worthy of protection, but rather that consideration of an appropriate sample of smaller and less unique sites would satisfy the need to preserve significant archaeological resources.

We, therefore, recommend that consideration of eligibility for the National Register be done on a district basis. This would include not only sites considered individually eligible (Category 8 in Table 7) but those which do not qualify on this basis (Categories 7 and 6), as in the aggregate they provide a sample of smaller and simpler sites.

It is worth pointing out that, except for the effects of flooding, current operations at the dam do not appear to threaten archaeological resources. Thus, once the effects of flooding were accounted for (see recommendations made below), the district nomination should not interfere with dam operation or maintenance.

#### Additional Management Recommendations

Anticipating that management programs at Two Rivers will be concerned with the area's resources as a whole, the following specific recommendations are made.

1) Many of the finds are outside the potential floodpool of the reservoir and are, therefore, not in danger of destruction by inundation. Moreover, current land use (dam operation and cattle grazing) do not threaten the finds. It is true that some of the finds (most notably LA 33100) have been adversely affected by construction, but these are not further threatened under present circumstances. Post hoc mitigation would only further reduce the surviving data base; the sites will be best off if left alone.

Therefore, no additional action is needed on a number of sites until such time that land use changes. The finds in question are: LA 33091 through 33105, 33108, 33111, 33116 through 33123, 33125, and 33126, and IF 1 through 21, 25, 32, 35, 36, 39 through 41, and 44 through 55.

2) Some of the remaining finds, although inside the potential floodpool of the reservoir, are unlikely to yield significant new data about the study area (cf. Table 7). Most, in fact, are isolated finds. Considering that similar remains occur outside the floodpool, we do not recommend further action on these remains: LA 33105, 33110, and 33114, and IF 23, 26 through 31, 33, 34, 37, 38, 42, 56, and 57.

3) Some of the finds within the potential floodpool are of sufficient importance to warrant further consideration. We have arranged these sites into two ranks of importance (see Table 7):

A) Sites warranting individual National Register status. These sites are discussed in the previous section of this chapter. Any mitigation or conservation program should include all of these sites (LA 33106, 33115, and 33124).

B) Sites not warranting individual National Register status, but each able to yield limited additional information on the study area. At present, these two finds appear to be unique examples of a particular site type within the study area. We do not consider our survey to have exhausted the information potential of these sites, and any mitigation program should consider additional study of each one. LA 33109 is the only possible tepee ring found (it is associated with a lithic and burned rock scatter); IF-24 is an early Euro-American bridge.

It is difficult to place LA 33107 in any category. If a substantial part of the site remains undisturbed, it would fall in (3B) above. However, we suspect that the site is too extensively damaged to yield significant new information and so do not recommend further work at the site.

4) We do not believe that mitigation is the next logical step in resource management at Two Rivers, although that approach may be indicated later on. Finds within the potential floodpool are in some danger, but so far, Two Rivers Reservoir has not come close to capacity. The areas most subject to flooding - the lower part of the floodpools - are already beyond help. In higher areas, it is possible that sites would be flooded only rarely, if ever; and it is to be questioned whether a short inundation once or twice a century will have a significant impact on sites within the lifetime of the dams. This is especially true of those sites that are lithic/burned rock scatters on shallow, rocky soils. We, therefore, recommend two intermediate steps for management:

A) The Corps should estimate the frequency and severity of future flooding within the reservoir area (a simulation of floodpool size may exist as part of original engineering data, and can be verified against records of the past two decades). Once this is done, a zone of repeated flooding should be defined; depending on that finding, a mitigation program for resources in that zone can be prepared. It is possible, however, that the zone of heavy flooding would be no greater than the present zone of flood disturbance.

TABLE 7. INDIVIDUAL EVALUATIONS AND RECOMMENDATIONS

<u>LA Number</u>	SITE EVALUATIONS					RANKINGS		
	I	II	III	IV	V	VI	VII	VIII
33091					X			X
33092					X			X
33093					X	X		
33094					X	X		
33095					X	X		
33096					X	X		
33097		X			X			
33098	?	X					(1)	
33099		X			X		X	
33100	X	X	X	X	X			X
33101					X	X		
33102		X			X		X	
33103	?	X			X		(1)	
33104	X	X	X	X	X			X
33105						X		
33106	X	?	X	?	X			X
33107	?	X					(1)	
33108					X		X	
33109		X			X		X	
33110		X				X		
33111					X	X		
33112					X	X		
33113		X				X		
33114					X	X		
33115	X	?	?		X			X
33116			X			X		
33117					X		X	
33118					X		X	
33119	X	X			X			X
33120					X		X	
33121					X		X	
33122					X		X	
33123					X		X	
33124	X	?	?		X			X
33125							X	
33126							X	
IF-24		?	X	?	X			X
All other IF's		(3)			X	X		

(1) depending on extent of undisturbed remains; chances of this are probably limited.

(2) Anglo component.

(3) in rare cases...see descriptions in Table 5.

Sites outside the heavy impact zone should be monitored but otherwise not disturbed. Extent of the monitoring program (which could include limited additional study or testing to better establish the nature of some sites) would depend on the extent of repeated flooding. Also, a carefully chosen sample of sites should allow adequate evaluation of general resource conditions. If monitoring indicated a deterioration of cultural resources, a mitigation program could be started.

B) Potential flooding is not restricted to the lands surveyed, but covers a large amount of easement land as well. We recommend that the Corps arrange for survey on that easement land. Because the distribution of many potential finds is not yet predictable, we recommend survey of as much of the area as possible. For both management and scientific purposes, finds made in the present study area are best managed along with those threatened in the easement area. Therefore, we recommend that such additional survey, if feasible, be a high priority in Corps management of the Two Rivers cultural resources.

C) For those sites with subsurface remains (LA 33098, 33100, 33103, 33104, 33107, and 33116), the Corps should consider whether additional information on subsurface extent, integrity of remains, or degree of disturbance is called for. If so, the Corps may wish to arrange for limited archaeological testing of the sites in question. We suggest, however, that such testing (especially for those sites not in danger of flooding) be given a lower priority than survey of easement lands.

5) Because the Hondo valley is known to have extensive buried remains, earthmoving activities in undisturbed portions of the valley floor should be avoided even if survey did not turn up sites in areas in question. If substantial earthmoving in the undisturbed valley floor is called for, prior archaeological testing with a backhoe may be necessary.

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## DEFINITIONS OF TERMS USED IN THE REPORT

### Lithic Technology

Tool Types: Tools in the site assemblages were identified primarily on a morphological basis. Although a functional designation of specific classes of tools is often implicit in the name designation (e.g., *scraper*), there is no explicit functional interpretation intended. Such functional interpretation cannot be made from morphological shape alone, but require detailed microscopic studies (Hayden 1979) which were not within the scope of this analysis and not advisable for surface-collected materials such as these.

Chopper: a marginally flaked cobble, block, or altered core, usually exhibiting shape alterations to create a sharp, straight cutting edge with a relatively steep edge angle, usually also with use-damaged edges resulting from pounding, chopping, or sawing.

Preform: A bifacially flaked core which has been fully edged and initially thinned and shaped. Edges are irregular, perhaps sinuous; often they are denticulate and retain remnants of the platform preparations (Muto 1971:68). The cross-section is generally regular and lenticular; the outline shape is ovate to subrectangular. Although technically an interim product for subsequent thinned biface tools and thus not a formal functional tool class, many specimens may have partially regularized edges and flaking resulting from use as a tool.

Thinned biface: a tool produced by bifacial flake removals from all (or two predominant) edges, with lenticular cross-section and regular edges, and with most remnants of platform preparations removed (Muto 1971:74). The only shape formally recognized was ovate, but other shapes were individually noted in the inventory under the general category of "other". The third variety of thinned bifaces categorized were fragments.

Projectile points: a tool shaped to a point to facilitate puncture while hafted to a shaft and used as a missile or lance. Identifications were made by comparison of morphological characteristics presented in Suhm and Jelks (1962). More detailed descriptions are presented in discussions of sites with points.

End scraper: a flake with steep unidirectional flaking and shape modification on the distal end.

Side scraper: a flake with steep unidirectional flaking and shape modification on a lateral edge.

Trimmed flake: a flake with unidirectional or bidirectional flaking on one or more areas of the edge. The flaking is generally limited in area and is the result of either intentional shaping or from using a previously unmodified flake. This category includes all small, lightly trimmed flake tools not otherwise specifically classified as a particular tool type.

Notch: a flake with a concave edge outline modification produced by flaking, usually in a unidirectional force application. Flaking is usually steep (more than 50°) and notches range from several millimeters to several centimeters wide and deep.

Denticulate: a flake with multiple edge flaking spaced to produce protruding points or teeth alternating with edge concavities. Flaking is usually from unidirectional force application.

Hammerstone: rounded rock which has been used to batter another usually hard material. It is recognized by characteristic battering bruises or crushing on the ends or edges. Stone material was usually a coarse grained quartzite but may be chert or other hard materials.

Manos and Metates: shaped and/or altered coarse-grained stone used to grind seeds and other foods. Material was usually coarse grained quartzite but includes sandstone. Most items recovered in the survey were small fragments and thus could not be categorized in more explicit terms.

Core Types: A core is a rock, generally cryptocrystalline silica, which has served as parent material for the removal of flakes. Formal flake production results in a wide variety of shapes of cores and flakes. Much of the variation is patterned and is the result of adaptations by the knapper to specific qualities of the raw stone material, the need to produce specific types of flakes (for use as tools or tool blanks), or from progressive consumption of the core. For the purposes of this analysis, six varieties of cores were recognized: tested, simple, complex, irregular, bifacial, and fragments. These encompass both consumptive and technological variation patterns.

Tested pieces: stones (cobbles or chunks) which have had only one or two flakes removed. These removed flakes are generally too small for use as tools and are often found associated with the cores. This is assumed to represent "testing" the stone to investigate its quality and observe

the flaking characteristics of the piece. Unsuitable stones are discarded; suitable pieces are subsequently flaked, resulting in another type of core.

Simple cores: three or more flakes removed are from a common platform area. This type generally includes cores with prepared platforms.

Complex cores: flakes are removed from multiple directions; the cores exhibit a higher degree of flaking.

Biface cores: these have biconvex crosssection and a continuous acute angle intersection between the flake removal faces. Flakes are removed from both faces, originating from all or two predominant (longest) edges. The category includes both cores used for the production of flakes and those which are destined for thinning into knives or other bifacial tools.

Irregular cores: cores flaked in poorly patterned sequence and which do not conform well to other core types.

Core fragments: pieces of probable cores with no characteristic attributes. Cores which have been recycled as tools, particularly with modifications, were classified as specific tools, most commonly hammerstones and choppers. Cores used as tools without modifications were sometimes evident and noted.

Flake Types: The flake types are of two basic categories: biface thinning flakes and hard hammer flakes. These were each subdivided into three types based on the amount of natural weathered surface or cortex extant on the dorsal surface of the flake. This occurrence is useful for identifying the stage of the reduction sequence which produced each flake. As a nodule is flaked, the cortex surface is progressively removed. The first flake removed has all cortex on the dorsal surface. The last flakes removed will have no cortex. Flakes with no cortex are called interior flakes. Flakes with partial cortex are secondary and flakes with all cortex are cortical. Since the various stages of reduction and types of manufacturing are often indicative of or associated with certain other activities, these types of reduction data provide a direct line of inference into site function.

Flake fragments: the distal portion of broken flakes. Seldom individually identifiable as to detachment technique or reduction stage (and thus rarely considered by most researchers), flake fragments are often informative data when quantified and evaluated in the whole assemblage.

Biface thinning flakes: These flakes are identified by the typical attribute combinations of lip or overhang on the ventral edge of the striking platform, an acute angle between the striking platform and the dorsal surface, generally a prepared striking platform including smoothing of the dorsal edge, and vaulted longitudinal cross-section (Bandy 1976:92). Different combinations and variations of attributes are generally related to specific stages of biface core thinning, special removal problems, detachment techniques, shape and size of the biface, and the type of stone material. Typical flake detachment method is by direct percussion with a baton or billet of bone, antler, wood, or other comparable "soft" material.

Hard hammer flakes: these flakes are distinguished primarily by the presence of a relatively pronounced bulb of force. Other features include large striking platforms, often eraillures, and ventral ripples and radiating shatter lines (Crabtree 1972:44). Detachment method is usually with a hammerstone. However, the above features are more reflective of high impact fracturing than hardness of the hammer (Tsirk 1979) and, therefore, not directly correlated with the technique (Mewhinney 1964).

Blades: blades are at least twice as long as their width, have relatively parallel lateral edges, and have at least one prominent dorsal ridge formed by a previous flake removal.

Sequence Flakes: These flakes, first described by Epstein (1963:28) as "cortex flakes," typically have a convex-shaped striking platform (as viewed from the inner or outer aspect) which is the natural cortex of a rounded chert nodule. The outer surface of the flake is the negative flake scar of a single flake detached at the same angle blow. Platform preparation is rare.

Core Trim Flakes: These flakes are detached from cores to remove flaking errors or otherwise rejuvenate the cores for additional flake production. Recognition of flakes of this type was hampered by their low frequencies, and by rather inconsistent attributes and morphological characteristics. Variations ranged from small platform overhang pieces to massive sections of cores which had been detached in order to remove a flaw or to obtain a new striking platform.

Other Terms:

Site (aboriginal): any spatial association of 5 or more artifacts (exclusive of burned rock), and for any location with architectural remains.

Site (European): any spatial association of 2 or more architectural features and/or any spatial association of five or more artifacts, with a probable age of 50 years or more.

Isolated Find: any aboriginal remains, or any European remains with a probable age of 50 years or more, not meeting the criteria for sites.

Hearth: a cluster of burned (calcined, heat-fractured, and/or heat-darkened) limestone rocks, usually about 1 m in diameter.

Midden: a cluster of burned limestone rocks usually substantially greater than 1 m in diameter.

Graywacke: dark, dense stone resembling graywacke (sensu strictu), but not mineralogically verified as such.

CONCORDANCE OF FIELD AND LABORATORY OF ANTHROPOLOGY SITE NUMBERS

<u>Field Numbers</u>	<u>Permanent Numbers</u>
TRS - 1	LA 33091
TRS - 2	LA 33092
TRS - 3	LA 33093
TRS - 4	LA 33094
TRS - 5	LA 33095
TRS - 6	LA 33096
TRS - 7	LA 33097
TRS - 8	LA 33098
TRS - 9	LA 33109
TRS - 10	LA 33100
TRS - 11	LA 33101
TRS - 12	LA 33102
TRS - 13	LA 33103
TRS - 14	LA 33104, Locus 1
TRS - 15	LA 33104, Locus 2
TRS - 16	LA 33104, Locus 3
TRS - 17	LA 33104, Locus 4
TRS - 18	LA 33104, Locus 5
TRS - 19	LA 33104, Locus 6
TRS - 20	LA 33104, Locus 7
TRS - 21	LA 33104, Locus 8
TRS - 22	LA 33105
TRS - 23	LA 33106, Locus 1
TRS - 24	LA 33106, Locus 2
TRS - 25	LA 33106, Locus 3
TRS - 26	LA 33106, Locus 4
TRS - 27	33107
TRS - 28	33108
TRS - 29	33109
TRS - 30	33110
TRS - 31	33111
TRS - 32	33112
TRS - 33	33113
TRS - 34	33114
TRS - 35	33115
TRS - 36	33116
TRS - 37	33117
TRS - 38	33118
TRS - 39	33119
TRS - 40	33120
TRS - 41	33121
TRS - 42	33122
TRS - 43	33123
TRS - 44	33124
TRS - 45	33125
TRS - 46	33126
TRS - 47	33104, Locus 9

Note: Isolated finds (IF1 - IF57) are not assigned Laboratory of Anthropology numbers.

APPENDIX 3  
ANALYSIS OF POLLEN  
FROM A PROFILE NEAR THE  
HONDO RIVER, CHAVES COUNTY,  
NEW MEXICO

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Pollen Samples From  
The Two Rivers Survey  
Hondo Valley, New Mexico

Five pollen samples from the face of a recent borrow pit drainage canal were taken near the canal's confluence with the Hondo River. The five samples were processed and analyzed at the Ethnobotany Lab, Biology Department, University of New Mexico.

We used a modification of the basic method for pollen extraction described by mehringer (1967):

1. A fifty gram soil sample was taken from the bag and weighed on a triple beam balance.
2. The sample was washed through a 180 mesh brass screen with distilled water into a 600 ml beaker.
3. Removal of carbonates - about 100 ml of 40% hydrochloric acid (HCl) was added to each beaker to remove calcium carbonates and to cause disaggregation of soil particles. When bubbling action ceased, each beaker was filled with distilled water and the sediments allowed to settle for at least 3 hours. The water and dilute HCl was carefully poured off after the settling, leaving the sediments and the pollen behind in the beaker.
4. Rinse - each beaker was filled again with distilled water, stirred, and allowed to settle for 3 hours, before pouring off.
5. Swirl - beakers were filled about 1/3 with distilled water, stirred with clean stirring rods without creating a vortex, to suspend sediments and pollen. One second after stirring stopped, the lighter soil particles and the pollen grains were poured off, into a second clean beaker. This procedure was repeated several times to physically separate the heavier sand grains from the lighter sediments and the pollen grains.
6. Removal of silicates - approximately 50 ml of hydroflouric acid (HF) were added to each beaker containing the lighter sediments and allowed to sit overnight. The samples were then rinsed with distilled water, allowed to sit 3 hours, and the water poured off. The sediments were transferred to 50 ml centrifuge tubes, rinsed and then centrifuged and the water poured off. Approximately 30 ml of HF were added to each test tube, stirred, and placed in a hot water bath for about 10 minutes. Tubes were then centrifuged and the HF decanted.
7. Rinse - tubes were filled with distilled water, stirred, centrifuged, and decanted. This was repeated twice.
8. Removal of organics - samples were rinsed with about 30 ml of glacial acetic acid, centrifuged and poured off prior to acetolysis.

A fresh acetolysis solution was prepared, of 9 parts acetic anhydride to 1 part of sulfuric acid. About 20 - 30 ml were added to each test tube, stirred, and placed in a hot water bath for about 8 minutes. Tubes were then centrifuged, the liquid poured off, rinsed with glacial acetoc acid, centrifuged again and poured off.

9. Rinse - the centrifuge tubes were filled with distilled water, stirred, centrifuged and poured off. This was repeated twice.

10. The samples were then placed in glass vials with glycerol, for storage.

11. Slides were prepared for microscopic analysis with a Leitz Ortholux microscope, at 250x, 400x, and 1000x. Identifications were made using Kapp (1969), other unpublished keys and the comparative collection of southwestern pollen types in the Ethnobotany Lab.

Following are the results of the analysis:

DAP, KS #1 - no pollen, heavy-walled spores.

DAP, KS #2 - no pollen, many arcellate tests (from one-celled organisms).

DAP, KS #3 - a few Cheno-Am, grass and low-spine composite pollen grains, and arcellate tests.

DAP, KS #4 - a few possible Cheno-Am pollen grains, much degraded, and many arcellate tests.

DAP, KS #5 - one grass, 5 pine (Pinus sp.), 1 low-spine composite, 1 Mormon tea (Ephedra torreyana type), and one lily family (Liliaceae) pollen grain types, and one spore which compared favorably to the Cretaceous fossil Cyathidites minor Cooper. There were also many other spores and tests.

The Cheno-Am pollen category consists of pollen from the goosefoot family (Chenopodiaceae) and the genus Amaranthus from the pigweed family (Amaranthaceae). Pollen from these taxa are usually indistinguishable with the light microscope. Plants of these taxa are wind pollinated, and are abundant pollen producers. This type of pollen is commonly found in pollen samples from the southwest. I was not able to distinguish which species of pine produced the pollen, as some of the morphological traits were not clearly visible. Mormon tea (Ephedra) is also wind pollinated and produces many, large pollen grains. Plants of the lily family (Liliaceae) are usually insect pollinated, and produce relatively fewer, large pollen grains. However, this pollen is occasionally observed in sediment samples. Grass pollen (family Gramineae) and low-spine composite (family Compositae) pollen are commonly found in pollen samples. No pollen of cultivated plants such as corn (Zea mays) or cucurbits (family Cucurbitaceae) were found.

Preservation was not good in any of these samples. The presence of many spores and tests is often associated with poor pollen preservation. Fungal activity could cause the breakdown of the otherwise durable pollen, especially in moist conditions. It is interesting that the most productive sample was from the lowest deposits (Level III?). Samples from deeper strata are often the poorest in pollen. It is possible that sampling in different locations in this stata could yield better results.

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